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IRRIGATION IN SOUTHERN INDIA.

IV.

The Basin of the Krishna.

The catchment basin of the river Krishna includes a great part of the region which has been the principal scene of the recent famine, and over which the rainfall is less than 30 inches in the year. This dry region comprises part of the Deccan, several districts of the Bombay and Madras Presidencies, all within the Krishna system, as well as that part of Mysor within the basins of the Krishna, Kaveri, and Pennair. Consequently the waters flowing from the part of the ghâts which overhangs this dry belt have a most important function. Upon its careful storage and distribution depends the existence of the inhabitants of a country 94,500 square miles in extent. For that is the area of the Krishna River basin. The streams whose fountains are in the Western Ghâts from about 13° 50′ N. to 19° 50′ N., a distance of 360 miles, all flow into the Krishna, the length of the main river being 800 miles.

The source of the Krishna is in the Mahabaleshwar Hills, within 40 miles of the western coast of India, together with those of its tributaries the Koina and Yena. The temple of Maha Deo, at Mahabaleshwar, is built at the foot of a steep hill, overlooking a deep ravine, and has an open space in front. The exterior is faced with pilasters painted yellow, the intermediate spaces being red. In the centre there is an arched doorway leading into an interior cloister built round a tank, into which a stream of water pours out of a cow's mouth. This is the source of the river, considered as the deity in a female form, and often spoken of as Krishna Bai, or the Lady Krishna. Tall trees and bushes cover the sides of the hill, such as roses, daturas, and jambul trees with heads of graceful white feathery flowers. The total rainfall, on these hills, which are only 4500 feet above the sea, is 200 to 220 inches.

Descending rapidly from its source, the Krishna flows past the beautiful city of Wai with its temples, and handsome flights of stone steps, and lovely Brahman women. It then enters the Satara district, and commences its beneficent irrigating work, in the face of special difficulties. The rivers, in the Krishna system within the Bombay Presidency, have so slight a slope that their fall would not gain much on that of a canal, while the steep transverse slopes of the valleys prevent canals from being taken to any distance from their parent streams. The rivers are filled at the time of rains, but during the long dry season of eight months they become mere threads. Here the objects are the retention of supplies of water which run to waste during the rains, and the command of the barren lands on the sides of the valleys. The principal work on the upper part of the course of the Krishna is called the Krishna Canal. A dam is thrown across the bed of the river at Kurvar in the Satara district, provided with scouring and regulating sluices. Thence a canal is taken with a slope of a foot a mile, and a course parallel to that of the river at first, but eventually receding from the bank so as to command a larger area of land, the number of acres irrigated being 1825. Within the same district the canals from the Yerla, Rewari, Chikli, and Gundauli tributaries irrigate 997 acres; and the Magni tank and canal works, 348. The canals from the Yerla River alone, if supplied during the dry season from storage tanks, would irrigate the area of 12,000 acres which they command. The projected Nehn Tank will effect this object. It will require an earthen dam 4400 feet long, with a greatest height of 63 feet. The drainage area above the tank is 60 square miles, and the average rainfall 24 inches. Another scheme, in Satara, is the construction of the Pingli Tank, on a tributary of the Máu River, in one of the driest tracts of the Deccan, with a fall of only 24 inches. A dam 53 feet high will impound 195¼ millions of cubic feet of water, and the tank will command 3000 acres by means of the Gundauli Canal.*

From the north the Krishna receives the River Bhima, draining, with its tributaries, the Sina, Nira, and Muta, the districts of Ahmednagar, Poona, and Sholapur.† The most important work in the basin of the Bhima is that for the water supply of Poona and Kirki. It consists of a masonry dam of great height and 2900 feet long, at Kharakwasla, across the Muta Valley, to form a reservoir. Two open ducts lead the water to Poona and Kirki, where the water is distributed by iron pipes. The canals are still under construction, and, when completed, will supply a large area with irrigation. The Ekruk tank, 4 miles north of the town of Sholapur, is on the Adíla, another tributary of the Bhima. The dam across the Adíla Valley is 7200 feet long, and 72 feet high in

* Satara has an area of 5378 square miles, with a population of 1,116,050 souls, or 208 to the square mile.

† Ahmednagar has an area of 6647, Poona of 5099, and Sholapur of 3925 square miles, with populations of 773,938, 907,235, and 662,986 respectively, being 116, 178, and 169 to the square mile.

the centre, with a waste weir at the east end. A lake is thus formed, with an area of 6½ square miles, and 35,840 acres are brought under its influence by means of three channels. The dam was completed in 1869.

From the south, and within the Bombay Presidency, the Krishna receives the Rivers Gatparba and Malparba, which drain the districts of Belgaum and Dharwar. The Gatparba has an independent course of 160 miles; and about 35 miles north-east of the town of Belgaum the river drops over a perpendicular quartz rock 176 feet high, forming the beautiful Falls of Gokak. In the rains the river is 180 yards wide, and temples, sacred to Mahadeo, are built on either side of the cataract. There are several proposals for utilising the waters of the Gatparba and Malparba, by a canal from the former river at Gokak, by a canal from the Malparba into the Dharwar plains, for completing the Kalhola-nullah, Churdi, and Maddak tanks. But the latter scheme is the only one that has been carried out. Belgaum has an area of 4592 square miles, and a population of 938,750, or 204 to the square mile. Dharwar, in an area of 4565 square miles, has a population of 988,037, or 216 to the square mile.

Most of the irrigation work in the Bombay districts within the basin of the Krishna has yet to be accomplished. Many great reservoirs for the storage of water, in this part of the basin, might be constructed, besides those which I have enumerated. For instance, Colonel Meadows Taylor, in his journey to Ahmednagar in 1853, mentioned how much he was struck with the capabilities of the country for large irrigation works, and, in particular, for tanks. Streams descending from the table-lands to the north, and flowing into the Sina, afford ample supplies of water, and the ground, from its peculiar character, provides most convenient basins, only requiring dams to be converted into large tanks. Until all this storage work is executed, the people will be exposed to periodical visitations of famine. It must always be remembered that improved communications can only afford the means of relieving, not of preventing scarcity of food.

After entering the territories of the Nizam, the Krishna leaves the table-land of the Deccan, and falls, by a descent of 408 feet in about three miles, into the lower level of Shorapur. Here, in the floods, there is a magnificent broken volume of water, rushing down an incline of granite with a mighty roar, and a cloud of spray dashing up high into the air. The Krishna then receives the Bhima, its chief northern tributary, and forms the northern boundary of the Raichur Doab, until it unites with its great southern affluent, the Tungabhadra. The country of Shorapur, between the Krishna and Bhima, was the scene of Colonel Meadows Taylor's administrative labours from 1841 to 1853, and irrigation received a full share of attention at his hands. His first essay at irrigation works was the repair and extension of the lake at Bohnal,* and it proved a complete success. He made it into a sheet of water 2½ square miles in area. His new tank at Kuchaknur, near Bohnal, has an area of 6½ square miles, and a dam 1872 yards in length, irrigating 10,000 *bigahs* of rice.

The great southern tributary of the Krishna, the Tungabhadra, has its sources in Mysor. It is formed by the confluence of the twin streams, Tunga and Bhadra, at Kudali, nine miles N.N.E. of the town of Shimoga.* It then flows northwards, receiving the rivers Warda, Choardi, and Kumadvati, and, on leaving Mysor, forms the boundary between the Madras and Bombay Presidencies, with the district of Bellari on the right, and that of Dharwar on the left bank. The Tunga, 149 miles long, has a catchment basin of 1389 square miles, of which area the drainage of 100 square miles is intercepted by tanks; the Bhadra, 160 miles long, has the drainage of 175 square miles, intercepted by tanks, out of an area of 1675; the Warda, 47 miles long, has the drainage of 180 out of 610 square miles, intercepted by tanks; and the Choardi, 43 miles long, has the whole area of its catchment basin—510 square miles—fully utilised. The Tungabhadra is never dry, and in the rainy season it swells prodigiously, and forms a rapid and muddy stream, ten feet higher than the rocks which stand out in its bed during the dry season. Its four sources, the Tunga, Bhadra, Choardi, and Warda, drain an area of 3754 square miles in Mysor, chiefly mountainous country, with a rainfall of 135 inches in the year. After the united stream enters the plains, it flows through a region where the rainfall is only 24 inches. The ancient name of the river is the "Pampa," by which it is mentioned in the Ramayana. The tradition is that Hiranyaksha, son of the Rishi Kasyapa, seized the earth, and bore it down to the lower world; upon which, Vishnu, assuming the form of the *varâha*, or boar, plunged into the ocean and brought up the earth again. The perspiration arising from this exertion trickled down the boar's tusks, and formed two streams, that from the left tusk being the Tunga, and that from the right tusk the Bhadra.

In the Bellari district the Tungabhadra has long been used for irrigation. At Desanur and Siragupa there are two *anicuts*, by which 2519 acres are irrigated. Next come the Valabapur and Korragul *anicuts*, being two branches, with an island between. The former is a reconstruction of an old native work, consisting of loose masses of stone. It is now of solid masonry, with *chunam*, and is 994 feet long. The ancient work was built by Krishna Rayel, the King of Vijiyanagar, in 1521 A.D. The Korragul is 400 yards long, of rough native work. Next comes the Ramanagadda *anicut*, across the western branch of the river, opposite the Island of Kuravagadda, and the Kuravagadda *anicut* crosses the eastern branch. The Roya channel is turned out of the river above this *anicut*, and has a tortuous course of 217 miles, ending in the Kamlapur tank. The Bella *anicut* is just above the village of Hossur, an ancient native work, concave towards the stream, only extending from the right bank to an island, and the channel from it is but 4½ miles long, then dividing into several smaller channels. The Turut *anicut* is taken across the river about a mile west of the old city of Hampi, and is formed of a number of bits of masonry, connecting islands and rocks. The channel from it is very tortuous. The Ramsagra *anicut* is an old, rough stone dam, running diagonally up the river, connecting islands and rocks. Its channel is 9½ miles long,

* *See* his Life, ii. p. 37.

* The Mysor district of Shimoga, including the basins of these sources of the Tungabhadra, has an area of 3797 square miles, with a population of 498,976, or 131 to the square mile.

and tolerably straight. The Kampli *anicut* also consists of detached pieces. The last dam is called Taumbiganur, whence the Rampur channel flows for 7 miles. All these *anicuts*, except the new one at Valabapur, were built by the ancient Kings of Vijiyanagar. The total length of the nine channels taken from them is 89¾ miles. There are also eight large tanks in the Bellari district, securing cultivation to 29,728 acres.

The Kings of Vijiyanagar did all in their power to fertilise the arid region over which they ruled from 1034 to 1524. Abdu-'r-Rizzak, the Envoy of Shah Rokh, in 1441, and the Italian Nicolo Conti soon afterwards, visited Bijayanagar, and both describe the magnificence of this city on the banks of the Tungabhadra, now a silent and desolate mass of ruins. Channels of water flowed through the streets and irrigated the gardens, while the larger channels from the *anicuts* were extensively employed for the cultivation of rice, sugar cane, cocoa nut, turmeric, and especially ginger. Many noble tanks, the largest nearly three square miles in area, were also constructed by the Kings of Vijiyanagar. Abdu-'r-Rizzak tells us that the country was well cultivated and very fertile, and that the city of Vijiyanagar was such that the pupil of the eye has never seen a place like it.

The people of the Bellari district have suffered sorely from the famine, and the English, as the successors of the Vijiyanagar Rajahs, are bound not only to maintain, but to extend and complete the irrigation works. The way is clear, and even detailed surveys have been executed by Mr. Gordon. The Bukkacherla project would have the effect of irrigating 11,000 more acres. The Ruddam project will add 1344 more, the Hindipur project will secure to eleven tanks a regular supply of water; and the Bomanahalli project is designed to form a reservoir capable of storing sufficient water to irrigate 64,000 acres. The water is to be distributed by two channels. Then there are the two schemes of the Madras Irrigation Company which have not yet obtained sanction. The first is for a canal to be taken from the Tungabhadra at Valabapur, to cross the hills near Daroji by a deep cutting and a tunnel 450 yards long, and then to take a nearly straight line to Bellari. Mr. Gordon completed his surveys for this project in 1867, ten years ago. It would have irrigated 150,000 acres. Another project would lead a canal from the Tungabhadra at Hossur, pass round the hills instead of through them, and thence go to Bellari. It is designed to irrigate 212,000 acres. The whole cost of these works would be 950,000*l.*, the interest on which at 5 per cent. is 47,500*l.* In 1854 about four times that amount was wasted by hurried expenditure on famine roads, and by remissions, besides the loss to the people of their crops and cattle. These facts speak for themselves. The famines in Bellari are mainly due to the persistent refusals to sanction the execution of feasible and well-matured irrigation schemes.

An important tributary of the Tungabhadra, coming from the Mysor district of Chitaldrug, is the River Vedavati, or Hagari. It is formed by two streams, the Veda and the Avati, both rising in the Baba Budan Mountains, and has a catchment basin of 2250 square miles, with a rainfall of 24 inches. It flows through the central belt of hills by the pass called Mári-Kanive, and soon after leaving Mysor receives a tributary called the Janagi-halla, or Chinna Hagari. It is a very shallow river, and presents a broad bed of sand in the dry season. The Hagari has a course of 114 miles in Mysor, with a catchment basin of 5295 square miles, of which 4097 have their drainage intercepted by tanks, and that of 1198 is not utilised. The Chinna Hagari is 53 miles long. Out of the 524 square miles of its basin, the drainage of 356 is intercepted by tanks. A number of small channels are drawn from the Hagari, in the Kadur district of Mysor; but the great project which would fully utilise its waters is still neglected. This is the construction of an embankment in the Mári-Kanive gorge, and the consequent creation of an immense reservoir that would irrigate 50,000 acres of the fertile but now arid plains of Hiriyur.* At the time of Dr. Buchanan Hamilton's tour in 1800,† this Mári-Kanive gorge, in the Chitaldrug Hills, was pointed out as a spot peculiarly favourable for the construction of a dam. But nothing has ever been done, and this is the more to be deplored because large sums have been spent in surveys and measurements. The whole Krishna system, within Mysor, has a united length of 611 miles, and a catchment basin with an area of 11,031 square miles. Out of this, the drainage of 6217, or 56 per cent., is intercepted by tanks.

After entering Bellari, there are channels taken from the Haggari which irrigate 1500 acres; and it falls into the Tungabhadra 72 miles above Karnúl. The Pennair is another river which, though not perennial, brings down large volumes of water with its freshes. It has a course of 100 miles in the Bellari district, and the construction of a few *anicuts* would change the face of the country. The Bellari district, with an area of 11,007 square miles, has a population of 1,668,006, or 152 to the square mile.

No region in India is more dependent on adequate supplies of water for the existence of its inhabitants than the Ceded Districts of the Madras Presidency; and when the Madras Irrigation Company was formed in 1860, with a capital of 1,000,000*l.*, having interest at 5 per cent. guaranteed by Government, the Ceded Districts were selected as the scene of its operations.

The project of this company was partially sanctioned in 1861. It was to divert, by means of an *anicut* at Sankasala, 17 miles above Karnúl, a portion of the flood waters of the Tungabhadra into the valley of the Pennair, through a capacious canal along the right bank of the former river, and across high land, forming its watershed to the east. But the other parts of the project, including the works for irrigating the Bellari district, and the construction of large reservoirs for the storage of water have not been sanctioned.

The refusal to sanction the construction of these reservoirs ensured the failure of the enterprise. From June to November there is abundance of water available from the Tungabhadra, which now runs to waste. But from November to June not a drop can be allowed to be abstracted from that river without injury to the Krishna delta irrigation. Capacious reservoirs for storage were, therefore, essential to provide for the summer supply of water. One would have been the Mári-Kanive, another would have been

* The Mysor district of Chitaldrug, which comprises Hiriyur, has an area of 4471 square miles, with a population of 531,360, or 119 to the square mile.

† See Buchanan's *Mysore* (2nd ed.), ii., p. 458.

in the Hindri Valley, covering an area of 28 square miles, and another at Kara Bellegal, about 30 miles from Karnúl. Large reservoirs were also to have been constructed at Mudaba, on the Tunga; at Lakkawali, on the Bhadra; and at Masur, on the Choardi. But permission to undertake these absolutely necessary works has been refused.

At Sankasala an *anicut*, 12 feet high and 1500 yards long, was thrown across the Tungabhadra. From its right flank the main canal is carried parallel to the river for 17 miles, with only one bank, from 16 to 34 feet high, the other being formed by the natural rise of the ground. Thus a quantity of land is submerged, while the single bank is subjected to violent action from the waves, owing to the extensive spread of water. Close to Karnúl the canal is taken across the Hindri River, on a fine aqueduct. At Metakondal, 72 miles from Sankasala, there is a cutting a mile long which takes the canal from the Krishna basin, across the water-parting, into that of the Pennair, descending the valley of the tributary Kolair into the Pennair itself, by a succession of locks, in a fall of 236 feet. The canal is completed from the Sankasala *anicut* on the Tungabhadra to the Pennair, a distance of 143 miles, but not so as to be capable of bearing the full amount of water, owing to weakness of construction. Another defect is, that sufficiency of waterway is not provided for the passage of flood waters, either under the canal or by surplus weirs in its banks, for the escape of storm waters entering it when full.

Water was first admitted into the main canal at Sankasala on the 10th of July 1864. In 1866, the original sum of 1,000,000*l.* having been found insufficient, the Secretary of State sanctioned the addition of 600,000*l.* to the Company's capital, also with a guaranteed interest of 5 per cent., on condition that the canal, as far as the Pennair, was completed by July 1871. By that date the main canal was made, all the sluices in it were built, and the channels for distribution were in progress, 216 miles of them, commanding 91,567 acres, being finished. But if the full amount of water was admitted into the canal the embankments and walls would fail at many places. The total expenditure on the canal, in India, up to 1876 has been 1,583,308*l.* The extent of irrigation in Karnúl was 10,420 acres, and in Cuddapa 5949 acres, total 16,369 acres; and the whole revenue from irrigation amounted to 5763*l.* There is no marked extension from year to year, and the financial prospects of the canal are most unsatisfactory, not nearly paying its working expenses. The rate charged for water, namely, 6 rupees per acre, is considered to be excessive, for ryots are unwilling to go to the expense of converting dry land into wet, when they have to pay so high a charge.

The Karnúl district has an area of 7358 square miles with a population of 959,640, or 130 to the square mile; and Cuddapa covers 8367 square miles with a population of 1,351,194, or 161 to the square mile.

The Tungabhadra, after a course of 213 miles, falls into the Krishna about 81 miles below Karnúl; and soon afterwards the main river approaches the gorges of the Eastern Ghâts. In this part of its course the Krishna receives several small tributaries on its left bank, from that part of the Nizâm's territory, which formed the ancient kingdom of Telingana. It is now included in the three zillahs or districts of Nulgunda, Kummum, and Eilgundel, which vie with Mysor and the Carnatic in the number of their tanks. Eilgundel is, however, within the Godavari river basin. A splendid system of tank irrigation was established by the ancient Telugu dynasties, and maintained by their Muhammadan successors. The surface of Telingana is undulating, with numerous hollows and depressions suited for tank basins, and detached granitic hills crop out in all directions. The drainage from summer rains is stored in tanks, of which there are upwards of 2000 in the Nulgunda zillah, and as many in that of Kummum. In many places permanency of supply is maintained by channels drawn from rivers or rivulets on the way to the Krishna. Thus a canal from the Musa, near Haidarabad, fills a series of four tanks, one below the other.

The Krishna and the Pennair, after passing through the Eastern Ghâts, supply water for two important systems of deltaic irrigation. The upper courses of these rivers and their tributaries traverse the wide belt of arid region, with a rainfall of less than 30 inches, which is exposed to periodical visitations of scarcity and famine. If the necessary storage reservoirs were constructed on the streams which command this region, so as to supply water in the years when the usual rains fail, there would be no more famine. It is quite true that, even if all water was intercepted and none was wasted, nothing like the whole calculated rainfall could be relied upon. Sir William Denison had a careful experiment made at Sydney, in New South Wales, which showed that not more than a quarter of the total rainfall, on a given surface of an average character, finds its way to the outfall. Still, after all possible allowances, the existing *data* show that, if no water within the Krishna catchment basin was allowed to run to waste, all danger of a recurrence of famine in that region would be at an end.

Karnúl and Cuddapa are divided from the districts on the east coast by the Eastern Ghâts, the highest peaks of which attain a height of 3000 feet. The slopes are covered with low jungle, in some places mixed with bamboo, and in parts timber of good size is met with. The Krishna passes through this chain, and enters the low country about 60 miles from the sea. Below Bezwara, near the entrance of the gorge, both banks spread out into rich alluvial plains. At Bezwara the River Krishna is 1300 yards wide, and has a depth in the dry season of 5 to 6 feet, in average freshes of 31, and in highest freshes of 38 feet. The flood discharge is 1,188,000 cubic feet per second. The Krishna and Godavari have produced the alluvial plain on this part of the east coast of India, and half-way between them is the Colair Lake, a low swampy tract representing the work which the two rivers have to perform before the alluvial plain can be regarded as perfect.

The English acquired this plain in 1766, and for eighty years they did absolutely nothing, while famine and pestilence periodically desolated the region. In 1833, when the rains failed, not less than 200,000 people died of hunger, the Government lost 900,000*l.* of revenue, and the loss of property amounted to 2,500,000*l.* So that neglect of irrigation works is a most wasteful, as well as a life-destroying policy. By establishing channel heads on the river banks at

the apex of the delta, and by securing there such a height of water as the levels of the lands to be irrigated may require, the whole tract below is placed under command, and its productiveness is secured to an extent only limited by the volume of water at command. The Krishna delta works affect an area of 2000 square miles, inhabited by 1,000,000 souls.* The river flows along an elevated central ridge, or backbone, with the country falling off gently towards the right and left, and a general inclination to the sea.

At Bezwara, the Krishna flows between hills, with a width of 1300 yards. The hills furnish an abundant supply of stone for building, and lime is easily procurable. The position is exactly at the apex of the delta, and the height is sufficient for purposes of irrigation. Here the *anicut* has been thrown across the Krishna. The work was begun in 1852. It consists, first, of a broad basis of heavy stones thrown into the river, and allowed to assume its own natural shape, 3750 feet long, 305 feet broad, 21 feet high in front, and 14 feet above the summer level of the water. It is faced with a casing of stone masonry, 75 feet broad, resting on a double row of foundation walls. The sill is 20 feet broad and 5 feet thick, of cut stone, bound together with iron clamps, and 1280 yards long. Under-sluices are provided at the right and left extremities of the dam, for the purpose of scouring out the silt in front of them, and thus keeping an open channel at the heads of the irrigation lines. The total length of each sluice is 132 feet.

On the Masulipatam, or left bank, the main channel from Bezwara breaks into two branches, 900 yards from the head sluices. One runs towards Ellore, 39 miles long, and the other to Masulipatam, 49 miles long. The first branch of the Ellore canal opens at the eighth mile, and is called Ryves's Channel, and a branch, 19 miles long, runs to Gudaveda. Various other channels spread over the delta, in the direction of Masulipatam. On the Guntur, or right bank, the main western channel runs parallel with the river, with two principal branches at right angles, the Vellatur and the Yeskapilli. The Commamur Channel runs south-west, away from the river, and will irrigate 100,000 acres, in a length of 50 miles. The whole length of the principal canals already finished is 254 miles; when completed their total length will be 320 miles. The irrigated area in the delta is 226,226 acres, yielding a revenue of 89,000*l.*

The river Pennair is connected with the Krishna system by the Madras Irrigation Company's canal, and the two rivers may be appropriately treated of together. The Pennair rises in the north of Mysor, describes a curve through the Bellari district, flows through Cuddapa, and falls into the sea about 19 miles below the town of Nellor. Its length is 355 miles, and the area of its catchment basin 20,500 square miles. During the course of ages the Pennair has formed for itself a delta of alluvial soil, peculiarly well adapted for rice crops, in the district of Nellor, the area of which is 8462 square miles, with a population of 1,376,811 souls, or 163 to the square mile. In former times numerous tanks were formed by the natives, to supply water for their crops, and small irregular channels were led off from the river. But in 1855 an *anicut* was constructed across the Pennair at Nellor, in order to secure a good and certain supply of water for all the tanks. In 1857 the flood waters rose to such a height and did such damage that a second dam was built. This also failed, and the present *anicut* designed by Sir Arthur Cotton, was completed in 1863. It is 677 yards long, with the crest 9 feet above the bed of the river. Hitherto it has stood admirably. The Pennair comes down impetuously in bursts of short duration, so that with a precarious river of this kind it is necessary to keep a reserve of water by means of the Nellor and other tanks. Thus the system consists of an *anicut* and a series of tanks, water being given direct from the *anicut* so long as there is water in the river. The supply channels are so adjusted as to discharge into the tanks until they are full, and then to supply the land direct. The irrigated area is only on the left bank, the levels on the northern side being too high.

The water supply under command will irrigate 64,000 acres, the quantity allowed per acre being 2¼ cubic yards per hour; and this will be supplied for 150 days, which is ample time for a rice crop to come to maturity. There are three main channels issuing from the primary feeder, called Jaffer Saib's, Krishnapatam, and Savepalli; under the two first 34,000 acres being cultivated, and under the last 30,000.

There are several more smaller rivers in the Nellor district which can be utilised for irrigation. A large reservoir could be formed near Gandepalem, which would be of immense use to the people, and where a tank existed in former times. Throughout Nellor there are 975 tanks, yielding a revenue of 94,000*l.*, fed by small rivers and streams which rise in the Eastern Ghâts. During the recent famine, one of the suggested relief works was the Sangam project for using the flood water of the Pennair. The head works are at Sangam, near Atmakur, and about 30 miles above the *anicut* at Nellor; and their object is to carry water to tanks and reservoirs for irrigation, by which 94,000 acres would be brought under wet cultivation.

The extension of the irrigation works connected with the Krishna and Pennair, and their tributaries, involves questions which touch the interests of by far the largest part of the arid country recently visited by famine. The complete utilisation of all the water within this area would be the cause of a great and beneficial change in the physical aspect of a vast region. Such a change, by following in the footsteps of the ancient rulers of the land, the Kings of Vijiyanagar and Telingana, it is the obvious duty of the English masters of India to effect.

C. R. M.

* In the whole Krishna district the population is 1,452,374, or 181 to the square mile, over an area of 8036 square miles.

INDIAN FAMINES AND SUN-SPOTS.

THE Madras Famine of 1877 has not been an unmixed evil. Following so closely in the wake of the scarcity in Bengal in 1874, it has challenged and received the most earnest attention of the English people and press, and Indian administrators have once again been compelled to face the question of the food supply of the people, and to feel that that question is one of supreme importance urgently calling for the most anxious and persistent consideration. We do not mean to imply that the Government of India has been neglecting its duty in this matter; it

may well be pardoned if it has failed to solve a problem of such magnitude with the data hitherto in its possession. Every year now, however, the Statistical Department is placing at its disposal more materials for the solution of the problem, and we shall be justified in requiring from the Indian Government which shall have to deal with the next famine in the East, a far stricter account of its stewardship than we could fairly have exacted in the year that is passing. Since the beginning of 1877, the question has assumed an entirely new aspect, and to Dr. W. W. Hunter, the talented and energetic Director-General of Statistics to the Government of India, is due the high credit of pointing out a way of escape from the iron grip of the gaunt demon which periodically devastates portions of our Eastern Empire. Dr. Hunter, our readers need hardly be told, is no new worker in this field. Since the creation by Lord Mayo, in 1869, of the Statistical Department, of which he was appointed chief, he has necessarily been in the front rank in every battle against famine, and has manfully striven to bring the question within the reach of calculation. On the outbreak of the Bengal scarcity of 1874, when the Indian authorities gave way to unreasoning panic and permitted themselves to be terrified by vague threats from England, Dr. Hunter made a careful but sober estimate of the requirements of the case, which the event proved to be absolutely accurate, and which, had it been adopted as the basis of relief measures, would have saved the country an expenditure of something like five millions sterling. His present service in the same cause is even more valuable. Hitherto he has dealt with the question how famine should most efficiently, and at the same time most economically, be treated when it has declared itself, or when its occurrence in the immediate future is apparent and inevitable. The question raised by his most recent researches is the very important one whether we cannot foretell the approach of the calamity in ample time to allow of our providing against the evil day.

While engaged in the end of last year in collecting rainfall statistics at Madras, with reference to the then impending famine, Dr. Hunter was struck by an apparent connection between the amount of the rainfall at that place and the number of sun-spots. Following out with his accustomed energy the inquiry thus suggested, he published in the beginning of this year a paper, in which he showed (1) that the rainfall at Madras follows a regular cycle of eleven years; and (2) that that period coincides in a marked way with the well-known eleven-year cycle of sun-spots, years of minimum solar maculation being likewise years of minimum rainfall. It was natural that this discovery should attract much attention, both as a matter of purely scientific interest, and because of its evident bearing on the important question of Indian famines; and it was much discussed in the scientific newspapers and by the Royal Society. In the meantime, Dr. Hunter has not allowed the matter to rest, and he now, in conjunction with Mr. Norman Lockyer, gives the results of his inquiries in a paper of great interest, published in the *Nineteenth Century* for November. We propose to give our readers a brief *précis* of the writers' argument, and to state the results arrived at in this essay.

After giving an account of some of the principal speculations regarding the constitution of the sun in which philosophers have indulged during the past hundred years, the writers recapitulate what is known regarding the solar phenomena, and the intimate connection between them and the energies at work on our planet. The three classes of solar phenomena with which we are familiar—sun-spots, uprushes of metallic vapour, and prominences—vary regularly and all together in a cycle of eleven years, so that, once in every eleven years, the number of sun-spots and of uprushes and of prominences is greatest, and once in every eleven years the number is at its minimum. Any one of these classes of phenomena may fairly be taken as the representative of the sun's energy, and the comparative number of sun-spots has been selected because, for the last fifty years, a careful enumeration of these has been made by Hofrath Schwabe, of Dessau; and the area covered by the spots has, more recently, been noted with great accuracy by other observers. Taking, then, sun-spot frequency as the index of solar activity, the question which Dr. Hunter and Mr. N. Lockyer propose to themselves in this paper is—whether the cycles of solar activity coincide with any well-marked cycles in the atmospheric or other conditions of the earth? On *à priori* grounds there is reason to suspect the existence of such a common cycle of terrestrial and solar phenomena; but the writers arrive at their conclusions, quite independently of *à priori* considerations, by adducing a number of facts and results arrived at by independent and isolated observers in every part of the world. They have directed their attention specially to four different classes of terrestrial phenomena, viz. (1) periodical variations in terrestrial magnetism and electrical activity; (2) periodical variations in temperature; (3) periodicity of wind-disturbances, hurricanes, and cyclones; and (4) periodicity in tropical rainfall. Written, as it is, with special reference to the question of Indian famines, the paper deals more specially with the rainfall cycle; but our readers will, we are sure, readily forgive us if, before proceeding to give an account of the part of the paper which refers to that subject, we very briefly state the results arrived at with respect to the first three classes of phenomena. These results are of great interest, not only as giving an idea of the extent of the field already covered in connection with the inquiry, but also, as we shall see, on practical grounds.

As regards the first class of phenomena, then, it is shown from a review and analysis of the mass of evidence contained in the observations of Gauss and Arago and Sabine, of Lamont, Wolf, and Gautier, Loomis, Tromholdt, Schiaparelli, Broun, and Balfour Stewart, that magnetic variations, irregular as well as regular (diurnal), follow a constant cycle of eleven years, and that this cycle coincides closely with the eleven-year sun-spot period. Further, it is not less evident that, to quote the words of Mr. C. V. Walker, Superintendent of Telegraphs, "earth-currents, disturbed magnetometers and auroræ are parts of the same phenomenon," and are all intimately connected with the relative number of spots on the sun's surface. The importance of this deduction, as affecting the practical working of telegraphs, is evident.

Proceeding to the second class of phenomena, a large amount of evidence is again adduced to show that a periodicity exists in solar radiation and thermometric variations, and that that periodicity co-

incides with the sun-spot cycle. The inquiry in this direction is complicated by such physical considerations as the constitution of the atmosphere of the earth and the various molecular conditions in which the vapour of water may exist; and the evidence is consequently, as might be expected, not altogether so satisfactory as in the case of magnetic phenomena. Nevertheless, some of the results obtained, and especially those arrived at by Dr. Köppen, are so striking that it is impossible not to believe that an intimate connection exists between thermometric phenomena and the sun-spot cycle.

With respect to the third class of phenomena, the evidence is much more convincing. The relation between sun-spot frequency and wind-disturbances has for some years been the subject of careful inquiry by Dr. Meldrum, Government Astronomer at Mauritius, who has dealt with the cyclones of the Indian Ocean, and by M. Poëy, who has, in like manner, studied the hurricanes of the West Indies. Five years ago, Dr. Meldrum established the coincidence between frequency of sun-spots and of cyclones, and the results of M. Pöey's researches are strongly corroborative of the existence of a cycle of wind-disturbances coincident with the eleven-year sun-spot cycle. Many of our readers, no doubt, noticed the account in the *Times* of the extremely interesting and valuable application of this discovery by Mr. Henry Jeula, Secretary to the late Statistical Committee of Lloyd's, who, conjointly with Dr. W. W. Hunter, endeavoured a few months ago to ascertain whether the periodicity in tropical wind-disturbances produced any well-marked effects on the shipping of the world. Tabulating the information obtained from Lloyd's Loss-Book for the two periods of eleven years since 1855, they found that "the marine casualties disclosed a cycle closely corresponding with the sun-spot period. The percentage of casualties on the registered vessels of the United Kingdom was 17½ per cent. greater during the maximum two years in the common cycle than during the minimum two years;" and that "the percentage of losses on the total, posted on Lloyd's Loss-Book during the eleven years, was 15 per cent. greater during the two maximum years of the common cycle than during the two minimum ones."

But it is necessary that we should hasten to give some account of the part of the essay which relates to the connection existing between tropical rainfall and famine, and the cycle of sun-spots. In dealing with this part of the subject, Dr. Hunter confines his remarks almost exclusively to Madras and Bombay, these being the stations for which returns are available for the longest periods, and at which the effects of the two great Indian monsoons are most clearly marked and can be best studied. The average annual rainfall at Madras is made up of 29 inches brought by the north-eastern monsoon (October to December); 17 inches brought by the south-western monsoon (May to September); and 2½ inches which fall between the monsoons—total, 48½ inches. Any considerable deficiency during either of these periods—or a partial failure of both the monsoons—results in famine. There are thus, for the purposes of such an enquiry as this, three elements of comparison, namely—(1) the total rainfall of the year; (2) the average supply brought by the north-eastern; and (3) the average brought by the south-western monsoon. Dr. Hunter examines each of these separately, with the following results. Firstly, whereas the average annual rainfall at Madras is 48½ inches, the average quantity which has fallen in years of minimum sun-spots, since the introduction of rain gauges, has been 34½ inches, or 29 per cent. less than in ordinary years. In the second place, the average rainfall brought by the north-east monsoon in years of minimum sun-spots has been only 17 inches, against the ordinary average of 29 inches, that is to say, this monsoon has brought 41 per cent. less rain in years of minimum solar maculation than in ordinary years. And, thirdly, in like manner, the south-western monsoon at Madras has proved distinctly deficient in every year of minimum sun-spots since the introduction of rain-gauges, in 1813. Moreover, this deficiency has not been confined to the actual years during which the sun-spots have been fewest. Including the years immediately preceding those of minimum maculation, we find that the north-east monsoon (the principal factor, as our readers will have noticed, in the Madras rainfall) brought 25·75 per cent. less rainfall than the average, and the south-west monsoon, 20·75 per cent. less than its average supply in these pairs of years. And the cycle is tested in yet another way. If, argues Dr. Hunter, there is a true coincidence, it should disclose a well-marked minimum group, at the extremities of the cycle (in the eleventh, first, and second years), and a well-marked maximum group in the middle of the cycle (the fifth, sixth, seventh, and eighth years). The years on both sides of the central maximum group (that is, the third, fourth, ninth, and tenth years) should yield intermediate results, and when taken together should form a well-marked intermediate group. On subjecting his figures to this test, the coincidence remains distinctly marked.

In like manner it is shown that the average rainfall in ordinary years at Bombay is 18 per cent. greater than the average in years of minimum solar maculation; and a similar result is arrived at by an analysis of the rainfall returns of the Cape of Good Hope.

We have said enough to show clearly the drift of this most interesting paper. The results arrived at by the authors may best be summarised in their own words: "We find," they write, "that as regards sun-spots and terrestrial magnetism a common cycle of eleven years is now an established fact; that there are indications (although not proofs) of an eleven years' cycle in solar radiation and mean temperature; that there is ample evidence of such a cycle in wind-disturbances; and absolute proof of a cycle of eleven years in the great factors of tropical rainfall. We further find that the eleven years' cycle in the separate classes of terrestrial phenomena correspond with the eleven years' cycle of sun-spots; and that with regard to the three sets of terrestrial phenomena on which we possess fullest evidence (magnetism, wind-disturbances, and rainfall), the correspondence is most clearly established."

The bearing of the law, as regards tropical rainfall, on the question of famine is evident. Deficient rainfall in India means total or partial failure of the crops, and the result is starvation or terrible distress. Five of the six famines which have occurred in Madras during the period of sixty-four years over which these re-

searches extend, have fallen within the three-years group of minimum rainfall and sun-spots, and the sixth spread over two years within the group and the year immediately preceding it. It is clear, then, that if we can (and within certain limits we undoubtedly can) predict groups of years of minimum solar maculation, we are forewarned of at least the probability of famine in those groups of years. Further than this Dr. Hunter will not at present go. He does not consider the data at our disposal sufficient to justify prophecy. But it is evident that the whole question of the treatment of Indian famines has, by this discovery, entered upon a new phase—that we must make the years of plenty provide for the years of dearth. And no Indian Governor who, with this warning before him, fails to provide against the evil day, will henceforth be held guiltless.

This paper in the *Nineteenth Century* is as suggestive as it is lucid and logical, but it is not our province here to follow the train of thought which it suggests, There is much that is sad in our position in India, and there is something specially pathetic in the reflection that the same sun which has so often made the thirsty earth crack and gape, and has shone with fierce and ghastly brightness on the bleached bones of the victims of famine, has, through all these years that we have been in India, borne on its face the warning words which we are only now learning to read.

WATER-PARTINGS *versus* RANGES.

MR. TRELAWNEY SAUNDERS, in the July (1877) number of the *Geographical Magazine*, has expressed his dissent from my statements regarding the Karakoram. While taking what I venture to consider very broad and correct views of Himalayan orography in general, he leaves, I think, room for discussion on this point. His treatment suggests the questions: Are the words *range and water-parting* convertible terms? Is every water-parting necessarily a range? The importance of accurate terminology in the description of mountain scenery by travellers and geographers is so great, as to justify, at least, a short discussion of what seems a crucial case.

I think, that, in a general way, it will be agreed that the words range and water-parting are not identical in meaning. The term range of mountains has reference to physical features, and implies something marked as regards extension, profile, elevation, &c. The word water-parting denotes merely a *function*, that of dividing the heads of streams which flow different ways. Nature might have been so constituted that the heads of streams were never parted except by a range of mountains. But it is not so. A pile of mud in a roadway may be a water-parting.

The particular point at issue between Mr. Saunders and myself may be thus stated:—"Is the water-parting between the Lob (Eastern Turkistan) basin, and the Indus basin, throughout formed by a range of mountains or no?"

According to Mr. Saunders's system we have here a portion of the Tibetan Plateau, bounded by two mountain chains, of which the northern chain is the Kuenlun, and the southern "which divides the Lob basin from the Indus basin . . . . is conveniently distinguished as the Karakoram Range." Of course this implies, and Mr. Saunders states, that the plateau itself forms a part of the Lob or northern basin, "the chains are here only separated by the upper valleys of the streams which water the plains of Yarkand, &c."

I will now give "the limited conceptions of the observer on the spot." Leaving out of consideration the extreme western part, I divide the Lob-Indus water-parting into two sections. *(See diagram.)* Regarding the first, or westerly section, Mr. Saunders and I are agreed. It is a mighty, snowy range, appropriately called the *Muztak*. The second section commences from the head of the Nubra Valley. It is about this that we disagree. Here we get to Mr. Saunders's Tibetan Plateau. As Mr. Saunders says, the head-waters of the Yarkand and Khotan streams rise on this plateau, and they flow off it through and round the Kuenlun Range (its northern bounding range); but if you go south from the heads of these streams, you find yourself still on the plateau, with other streams rising on it, and flowing off southward, into the Shayok River (an Indus feeder), through narrow gorges, formed in a mighty chain of snow mountains, which is a continuation in direction, and in every other characteristic, of the Muztak Range. This chain, which I will call the Eastern Muztak, forms the southern boundary of the plateau.*

Now, Mr. Saunders ignores this great mountain range, and because he justly considers that the plateau has a southern bounding range, he carries this round the heads of the streams which run off the plateau to the southward, and therefore places the southern bounding range to the north of a considerable portion of the plateau. It is the more strange that he should ignore the real southern bounding range, and insist that the range must be where he sees on a map the sources of the streams, because, in another part of the same article he justly reprobates as heretical the assumption that "a succession of peaks in the same direction do not constitute a chain if *rivers rising on one side* passed between the peaks *to find their outfall*

* The following is the description given by a recent traveller *from the South*. Ascending on to the plateau through one of the gorges just described, from the Shayok River, he writes:—"At the top of the ascent a strange sight met our view, for we found ourselves on an immense undulating plain—the Depsang—which looked like the top of the world. . . . . Northwards, in front of us, we saw a few irregular, flat-topped hillocks—they looked like—scattered about. . . . . I had occasion to look back in the direction of the route by which we had come. A fine snowy range of mountains met my view, and looked quite continuous, but, of course, this was a deceptive appearance, as we had passed through this apparent chain without crossing any pass. . . . . These limestone mountains and peaks are, probably, as Mr. Shaw says, the continuation of the Mustagh Range; but where is the Karakoram Range? The only thing seen from the vantage ground of Depsang (17,817 feet above sea-level) that *looked* like a range we had passed through and left behind us, while the Karakoram *Pass* was distant about 25 miles (to the north-west, among the seeming hillocks)."—Dr. Scully's "Contributions to the Ornithology of Eastern Turkistan," in vol. iv. of *Stray Feathers*. (Calcutta, 1876).

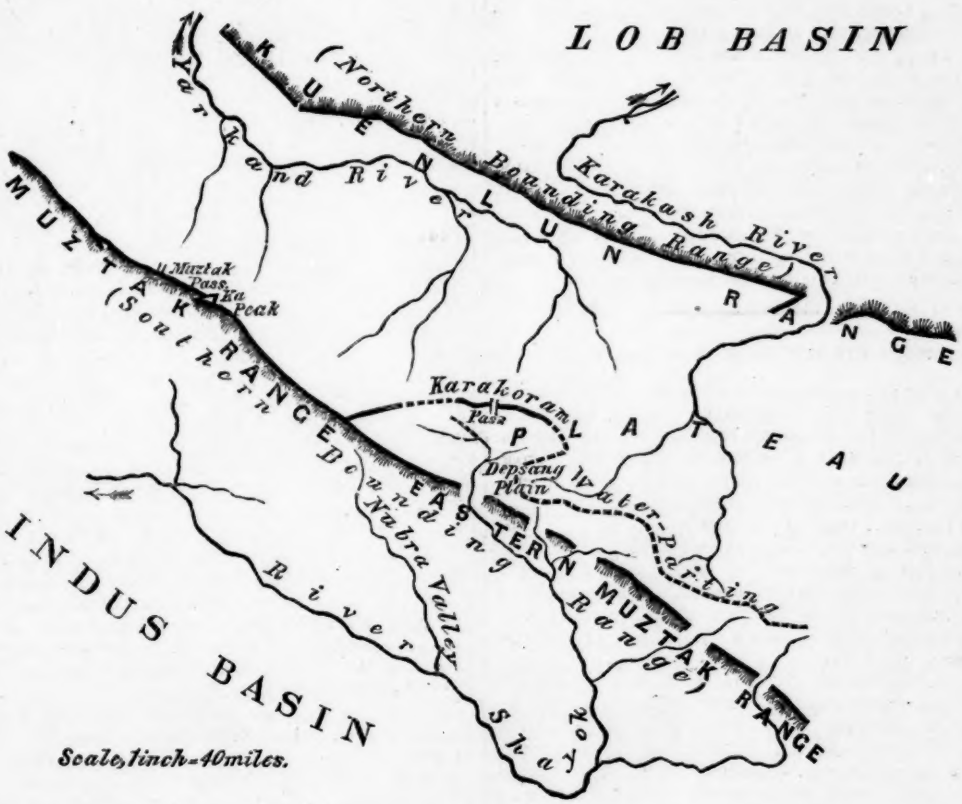
I had previously drawn Dr. Scully's attention to the question, and asked him to observe the facts, so as to be able to form an independent opinion.

Dr. Thomson, the first English traveller who visited the Karakoram, writes in a similar way regarding the great range which bounds the Depsang on the south.

The Depsang Plain itself, although to the south of Karakoram, is believed to drain, by its north-east corner, into the Karakash (in the basin of Lake Lob).

on the other." This is precisely the case with the Eastern Muztak. We might as well ignore the *northern* bounding range (the Kuenlun) because it is penetrated by the streams from the plateau, and talk of the central water-parting (the Karakoram) as being the *northern* escarpment of the plateau. The difference is only in degree, for a greater portion of the plateau lies on the north than on the south of the Karakoram water-parting.

It is as if we had a broad terrace, supported by a wall on the north and a wall on the south. Because these walls have got into bad repair, and the rain water, falling on the surface of the terrace, forms there



little runlets, which trickle out in places, through cracks in the masonry, we have no right to say that this no longer forms a wall, and to describe the supporting wall as running along the middle of the terrace, behind the heads of the little streamlets.

I therefore hold that, from the head of the Nubra Valley, the *water-parting*, which has hitherto coincided with the (Muztak) *range*—begins to be divorced from it, the latter continuing in a straight line across the head of the Shayok River and of some of its feeders, which penetrate through gorges from behind the range; while the former (the water-parting), of course, runs round the heads of these streams, across the plateau. It is in this portion of the water-parting that the Karakoram Pass is situated; and to this parting Mr. Saunders would assign the title of a range; indeed, he makes it such a principal feature of his southern bounding range as to carry its name westward, on to the Muztak section, which is really a range.

If we now inquire why this water-parting should be called a range we obtain the following answer from Mr. Saunders: "If any mountains are entitled to the name of range it is the Karakoram, for the following reasons; (1) Its culminating summit attains a height of 28,278 feet in the peak labelled K 2." But it is obvious to remark that this peak is situated in the undisputed section, viz., in the Muztak Range to the west, overhanging the Muztak Pass. This, of course proves nothing about the Karakoram section. Mr. Saunders continues: "(2) It forms an unbroken water-parting between the important drainage of Lake Lob and the Indus." But as nobody disputes its being a water-parting, and the only question is whether it is also a range, this proves nothing; unless we argue that every water-parting is necessarily a range.

Mr. Saunders again continues: "(3) Its length exceeds 300 miles; and whether we regard its height, its length, its water-parting, its passes, its bold and

massive character, its extraordinary glaciers, or its deep gorges, it is certainly one of the most remarkable ranges in the world. The lamented traveller, G. W. Hayward, argues with us."

Here we have again a confusion between those sections of the water-parting, which are indisputably a range, and those which are under discussion. My poor friend Hayward's authority will avail nothing here, for he never saw the Karakoram. Mere *length* would certainly not make that a range, which was not so otherwise. The *height* (unless we are talking of the absolute elevation of the whole region above sea-level) has been shown to belong to the Muztak Range. The *water-parting* proves nothing regarding its being also a range or not. A *bold* and *massive* character, extraordinary *glaciers*, and deep *gorges*, all belong in no degree to it, but to the Muztak Range, east and west. Nothing could be less bold or massive than the eminences on the surface of the great plateau, over which the Karakoram Pass leads. This at least can be tested by the "limited vision of the observer on the spot."* There is no boldness on the Karakoram, neither are there any glaciers or gorges. A man would find the greatest difficulty in breaking his neck anywhere nearer to the Karakoram than the Eastern Muztak Range. In other parts of the water-parting I have walked across, in an open plain (very elevated, of course, but) far away from any mountains, from the heads of streams flowing towards Lake Lob into the heads of others which feed the Indus.

It may safely be said that this line of water-parting, which in places is an open plain, and in places a ridge of low profile (see last note), would never have been called a great range had it not happened to divide two important basins. But I would urge that this is a confusion of ideas. The *importance* of a water-parting does not make it into a range if it is not one otherwise. The essence of a range stands in its *shape*; that of a water-parting in its *function*. Every range is a water-parting (more or less important and continuous). But every water-parting is not a range. A hillock or a flat expanse of sand do not rise into the dignity of a range, because they chance to separate two important drainage basins. An ox which is ridden by a king does not become a horse.

Nor is it necessary to Mr. Saunders's main argument to convert the Karakoram into a range. His system of a plateau, bounded by two mountain chains, north and south (the Kuenlun and the Muztak according to my nomenclature) would be quite correct if he would admit that the water-parting between the Lob and the Indus basins occurs on the plateau (and does not coincide with either of the ranges until further west), and that both the bounding ranges are cut through by the streams from the plateau (as he already admits that the northern range is cut).

My protest (in which I should have expected Mr. Saunders's support) is raised against the practice of tracing out on the map a line dividing the headwaters of the streams belonging to separate basins, and then assuming that along that line, and there only, runs a range.

Finally, I may note in passing, it is strange that the western portion of Mr. Saunders's "Tibetan Plateau" excludes the greater part of the table-lands of Western Tibet, viz. Zanskar, half Ladàk, Rupshu, Gugé, &c.

ROBERT B. SHAW.

SIMLA, *Oct.* 4, 1877.

* Dr. Scully writes: "We ascended a few hundred yards to a small commissure of loose detritus connecting two low hills, and found ourselves on the Karakoram Pass. . . . . The descent on the north side was even less than the ascent had been, and altogether the Karakoram Pass reminded one much more of a short embankment 300 feet or so above the level of the surrounding country, than of what one understands by a 'Mountain Pass.'"

Nor is it the case merely that the "summit of the Karakoram is in part flattened," as Mr. Saunders says. This is quite the boldest part of the water-parting, if we consider it in its length. While, if we take a cross-section drawn to scale, and taking the lowest points between the Karakoram and the ranges north and south of it respectively, as representing the level of the surrounding country; separating these points (which are really 45 miles apart) by a space of six inches on the paper, the height of the Karakoram above the straight line which joins them would be rather less than one-twentieth of an inch, on the same scale, and that of the highest point on the line of the water-parting not so much as twice that. This is the boldest part of the Karakoram water-parting.

THE ARCTIC FÖHN.

I OBSERVE a highly-important article on "The Greenland Föhn" in the *Geographical Magazine* for September, by Captain Hoffmeyer, Director of the Meteorological Institute, Copenhagen, wherein reference is made to a rise in temperature experienced on the west coast of Greenland between the 23rd November and the 11th December 1875. As the weather at Discovery Bay, latitude 81° 44′ N., and at Floeberg Beach, latitude 82° 27′ N., nearly 1300 miles north of Ivigtut, the most southerly station noticed, was similarly disturbed at about the same period, the following notice may be of interest.

The winter quarters at Discovery Bay were protected from the S.E., through N.E., to West, by precipitous hills attaining an altitude of upwards of 2000 feet. Two miles towards the S.W. an island, 2050 feet high, protected the ship from that direction. Only S.E. or W. winds could reach the station direct. Consequently the records of the winds are merely of those at the locality, and do not denote the winds prevailing in the neighbourhood.

"Floeberg Beach" was protected from S.S.E., through S.W., to N.N.W., by hills 500 feet high, sloping gradually up to an altitude of 1000 feet, at 10 miles distance towards the S.W.

The average temperature at each station due to the season should be from —20° to —27°. From noon of the 26th of November until 8 P.M. of the 13th December, except for a few hours on the 9th, the temperature remained above this average. From the 2nd to the 7th of November, southerly winds, accompanied with a low barometer, raised the temperature at both positions above the average. On the 8th a northerly wind, which did not reach the station at Discovery Bay, set in at Floeberg Beach; the temperature at both stations falling below zero, with a rising barometer.

The barometer continued to rise until the 12th, when it attained its highest level recorded during the year, the reading corrected being, Discovery Bay at noon, 30·877 inches; Floeberg Beach, at 5 and 6 A.M.,

30·821 inches. The weather was calm, with light variable airs: temperature about the average.

On the 21st, with light northerly winds, the temperature at each station fell considerably, the mean on the 22nd being —40° at Discovery Bay, and —41° at Floeberg Beach.

On the 23rd and 24th light northerly winds kept the temperature low, with an average barometer rising slightly.

At 9 A.M. of the 26th, at Floeberg Beach, a light air from the West backed round to S.S.W., and afterwards to S.S.E., with a quickly-rising temperature and slowly-falling barometer. The wind lasted fifteen hours, varying from calms to squalls. At 9 P.M. the temperature had risen to +19°.

During this period the 'Discovery,' in her protected position, experienced calm and cold weather; only one light puff from the S.E. reaching her at noon, the highest temperature being —10°. We must, therefore, conclude that the warm blast which reached Floeberg Beach passed clear of Discovery Bay in its passage north.

At Floeberg Beach the disturbance lasted until 1 A.M. of the 27th, when it was checked by a squall from the west, which instantly lowered the temperature to —10°, about the same temperature as the 'Discovery' experienced at the same time.

During the four following days the 'Alert' experienced variable light airs from the N.W., with a high temperature, from —13° to —7°, a most unusual occurrence.

At Discovery Bay, although the four hourly readings recorded a similar temperature, the maximum thermometer recorded +1°·6 at midnight of the 28th, and +5° on the 30th. These blasts of warm air did not reach Floeberg Beach.

The barometer rose steadily from midnight of the 26th until midnight of the 28th, falling on the 29th, and remained steady at 30 inches on the 30th. On the 1st December a southerly wind was blowing at both stations, with occasional light squalls from an opposite direction, temperature —5° to —10°; but the maximum thermometer, read at noon of the 2nd, registered +3°·2 at Floeberg Beach. That at Discovery Bay, at midnight of the 1st, registered zero; and on the 2nd, +3°. At 8 P.M. on the 2nd, another south-easterly wind, accompanied with a falling barometer, reached Floeberg Beach. At 4 A.M. of the 3rd, the temperature rose above zero; at 7.30 A.M. a squall from the S.E. raised the temperature to +25°; at noon the maximum thermometer registered +34°, and at 8 P.M. +35°. At 10 P.M. a sudden shift of wind to the northward lowered the temperature immediately, and at midnight it was down to +4°.

This very warm blast passed the latitude of Discovery Bay without affecting the temperature there, the maximum temperature registered being +4° only. Light north-westerly winds and calm were experienced.

At 5 A.M. of the 4th, another southerly squall, lasting two hours, reached Floeberg Beach, raising the temperature from +2° up to +23°. At 8 A.M. a breeze from the N.N.W. caused it to fall below zero again

This last wind forced its way into Discovery Bay, and affected the temperature there to an equal degree, but not at quite so early a period in the day. At 1 A.M., a gale set in from the S.W.; at 5 A.M. the temperature was +2°, wind variable; at 9 A.M., +16°; at 11 A.M., +21°; and about noon, when the cold air current had replaced the warm blast at Floeberg Beach, the 'Discovery' registered a temperature of +26°, with a S.E. wind the temperature then gradually fell, with a N.E. wind; at 8 P.M. it was below zero, and by noon of the 5th it was calm, with a temperature of — 20°.

At both stations the barometer rose slightly for 29·70 inches during the 3rd and 4th to about 30 inches. At 8 P.M. of the latter day it commenced to rise rapidly, with a falling thermometer.

At 8 A.M. of the 6th, when it was calm at Discovery Bay, temperature —11°·6, the 'Alert' experienced a S.S.E. wind, which raised the temperature to — 2°. A succeeding northerly air lowered it to — 12° the same temperature as at Discovery Bay, which station the warm blast passed without affecting.

At 3 A.M. of the 7th, during calm weather the temperature at Floeberg Beach again rose above zero, and remained above for twelve hours, the maximum temperature being +4°·8. A similar rise in temperature occurred at Discovery Bay, a few hours later, but then a squall from the S.E., which did not reach Floeberg Beach, was felt at noon. The temperature remained high at both stations until the afternoon of the 9th, when it fell below — 20°, the fall occurring earliest at the most northern station.

Between the morning of the 10th and evening of the 13th, each station experienced variable light airs and calms, with a low barometer, reaching 28°·979 at Floeberg Beach, and 28°·995 at Discovery Bay, the lowest reading recorded during the year, the temperature rising to — 7° at the first station and — 5° at the latter.

By midnight of the 14th, although the barometer remained low, the disturbance had passed away at both stations, the temperature ranging between — 20° and — 40° during the following fortnight. An unusual quantity of snow fell on the 6th, 7th, and 8th December.

It would appear that the disturbance that caused the rise in temperature, producing a heat excess of 46° at Upernivik on the evening of the 25th November, arrived at Discovery Bay and at Floeberg Beach about twenty-four hours afterwards, producing a heat excess at the northern station of about 40°.

On the 3rd December there was a heat excess of about 58° at Floeberg Beach; and on the morning of the 4th, at both stations, a heat excess of about 46° or 48°. In my journal of the latter date I find recorded: "This last gale undoubtedly travelled to the northward from Baffins Bay, perhaps from the Atlantic. The warm air is at a higher temperature than any water within some 600 miles of our position."

On the 13th I wrote:—"Any force that could put in motion so vast a body of air as must be necessary to affect our temperature of 50° of Fahrenheit, raising it from — 20° to + 35°, and to keep it above the average for eighteen days, between the 25th November and the 13th of December, must have been very considerable, and I cannot but expect that very severe weather must have occurred even as far south as Cape Farewell."

G. S. NARES.

MR. STANLEY'S VOYAGE DOWN THE CONGO.

LETTERS from Mr. Stanley were published in the *Daily Telegraph* on November 12th and 22nd, in which he gives particulars of his voyage down the Congo from Nyangwe to the Yellala Falls. He thus discovered the unknown portion of its course.

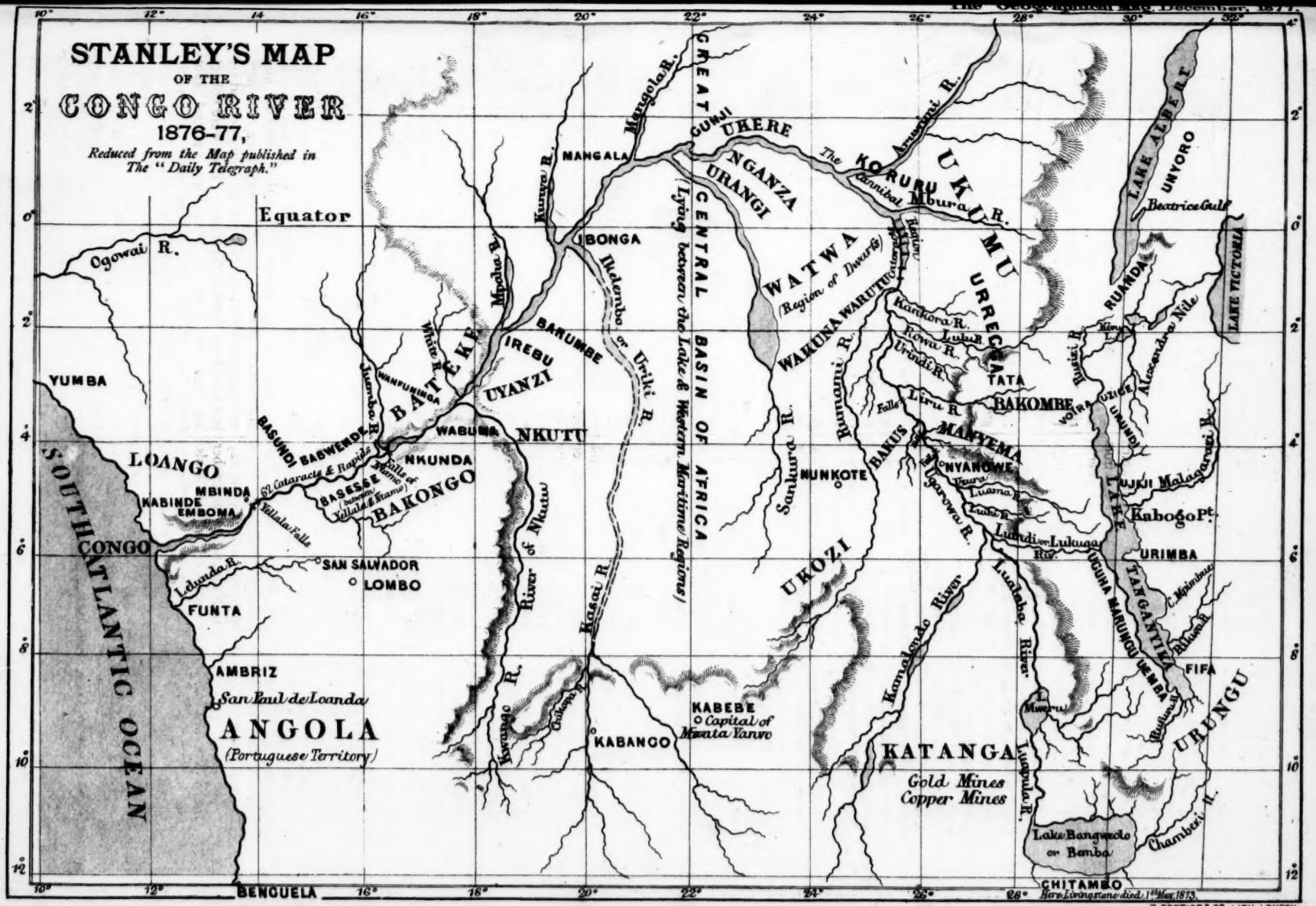
In our numbers for December 1872 (p. 274) and July 1875 (p. 224) we gave some account of the discovery of the mouth of the Congo by Diogo Cam in 1484, of its exploration by subsequent Portuguese expeditions as far as the Falls, and of the enterprise led by Captain Tuckey in 1816. On the 9th of September 1816, after having marched round the Falls, Tuckey reached his furthest point on the Upper Congo, upwards of 200 miles from the sea. He ascertained that the great river was flowing from a north-east direction, and the flood indicated that it came from the tropical region north of the equator. The work before Mr. Stanley was to complete the discovery of the Congo from Nyangwe, the point reached by Livingstone and Cameron, to the furthest point attained by Captain Tuckey above the Yellala Falls. The distance between the two points is about 700 miles.

Mr. Stanley left Nyangwe on November 5th, 1876, taking with him an Arab escort, as well as his own Zanzibar men. He at first marched by land, but returned to the river at a point 41 miles north of Nyangwe, in latitude 3° 35′ 17″ S. Here the boat, 'Lady Alice,' was put together, and launched on the Lualaba for the first time. After leaving Nyangwe, the Congo flows northwards as far as the equator, along the skirts of the Ullegga Mountains, which here separate the basins of the Congo and the Nile. Along the river banks, on both sides, dwell fishermen, called Wagenya, who are described as a cowardly and crafty tribe. In this part of its course the Congo receives the Liru, Urindi, Rowa, and Kankora, on the right bank; and the Riuki, Kasuku, and Lomamé, on the left, besides scores of minor streams. At the mouth of the Riuki, a formidable attack from the natives, in canoes, was repulsed, and two days afterwards, the Falls of Ukassa were reached.

On the 6th of December the explorers reached Usongora Meno, and, proceeding down the river, at a place called Vinya -Njara, 125 miles north of Nyangwe, another attack was made upon them, and, to add to their difficulties, as many as seventy-two were down with smallpox. Mr. Stanley seized upon the native town of Vinya Njara to house the sick and wounded, and for two days and nights he and his party repelled fierce attacks from the savages. The whole country was roused against the strangers. Here the Arab escort, after accompanying the party for 125 miles, set out on their return to Nyangwe on December 28th. Stanley's party then consisted of 146 souls. On January 4th, 1877, they came to a series of cataracts below the junction of the Lomamé, called the Baswa Falls, in latitude 0° 32′ 36″ S. They are caused by spurs from the Ullegga Mountains. It was necessary to make roads through the forest, and to drag the canoes round the falls, exposed to incessant attacks from the natives. By the 27th of January they had passed 42 miles by six falls, and had dragged the canoes for 13 miles by land, over roads which they had cut through the dense forest. The last fall is in 0° 14′ 52″ S. The river then gradually widened from 2000 yards to several miles, and began to receive grander affluents. They had reached the great basin lying between the maritime and lake regions. Here the Congo receives the Aruwimi, a great river on the right bank, which Mr. Stanley conjectures to be the Uellé of Schweinfurth. On this part of the voyage the cannibal tribes begin, and intercourse became very precarious. Near the confluence of the Aruwimi the explorers were attacked by fifty-four canoes of great size. One had forty paddlers on a side, with paddles 8 feet long, spear-headed and pointed with iron blades for close quarters, the top of each paddle shaft being adorned with an ivory ball. The chiefs pranced up and down a planking that ran from stem to stern, and on a platform near the bow were ten warriors swaying their spears ready to throw. In the fifty-four canoes there were about 2000 savages. Of course their weapons had no chance against breech-loaders, and they were driven on shore, and chased to their villages, where an immense quantity of ivory was found, used for various purposes. Stanley only lost one man in this encounter.

After this the explorers went down mid-stream, avoiding collisions by keeping among the labyrinth of islands. Thus they glided down the river for five days, when want of provisions obliged them to touch at a village, where the natives were friendly, in 1° 40′ N. and 23° E. The chief informed Stanley that the name of the river was the Congo.

On the 14th of February 1877 they lost the island channels, and were carried by the current towards the right bank, in the country of the fierce and powerful Mangala tribe, armed with muskets. Here there was another battle, but again the old muskets, loaded with slugs, were no match for Stanley's breech-loaders, though the battle lasted from noon to near sunset, the canoes all the time drifting down stream. After this the explorers once more succeeded in passing through island channels for four days, unseen by the natives, the river being 5 to 10 miles wide. This brought them to a very friendly tribe at a place called Ikengo. Near here a great river, called the Sankorra, is marked on the map as entering the Congo on the left bank, the same water or lake of which Cameron received information. Next they came to the Kassai, which at its mouth seemed to be nearly as important as the main river. The waters do not commingle for 130 miles, when the Kassai gives the previously clear waters of the Congo a light brown tint. Stanley next came to the mouth of the Kwango, which he describes as a deep stream, 500 yards wide, entering through a line of hills. Six miles below the Kwango confluence, the party was again attacked, and this was the thirty-second and last fight from leaving Nyangwe. They were collecting fuel to make a fire, when several shots from the bush wounded six of them. A regular skirmish followed, which ended in a drawn battle. The main stream now becomes of enormous breadth. But, on reaching the falls, the Congo becomes straightened by banks of naked cliffs, or steep slopes, fringed with tall woods, and piles of naked, craggy rock; and then the waters swept impetuously down in serpentine curves, heaving upward in long lines of


STANLEY'S MAP
OF THE
CONGO RIVER
1876-77,
Reduced from the Map published in The "Daily Telegraph."
Equator
Ogowai R.
YUMBA
LOANGO
MBINDA
KABINDE
EMBOMA
CONGO
SOUTH ATLANTIC OCEAN
Loanda R.
SAN SALVADOR
LOMBO
FUNTA
AMBRIZ
San Paul de Loanda
ANGOLA
(Portuguese Territory)
BENGUELA
BASUNDI
BABWENDE
Juamba R.
Falls of Yellala & Ntamo
Yellala Falls
NKUNDA
BASESÉ
BAKONGO
MANFUMINGA
White R.
BATEKE
Mpaka R.
IREBU
BARUMBE
WABUMA
NKUTU
UYANZI
Ikelemba or Uriki R.
River of Matuo
Kasai R.
Kwango R.
Quilow R.
KABANGO
KABEBE
Capital of Muata Yanvo
Kuywa R.
MANGALA
IBONGA
Mangola R.
GREAT
GUNJI
UKERE
NGANZA
URANGI
(Lying between the Lake & Western Maritime Regions)
CENTRAL BASIN OF AFRICA
WATWA
(Region of Dwarfs)
WAKUNA WARUTU
Rainu R.
Kankora R.
Rowa R.
Urinda R.
Liru R.
Falls
BAKUS
Sankuru R.
NUNKOTE
Rumami R.
UKOZI
Kamalondo River
Lualaba River
Lupula R.
KATANGA
Gold Mines
Copper Mines
Lake Bangwelo or Bemba
Chambezi R.
CHITAMBO
Here Livingstone died 1st May 1873.
The Commercial Route
Cannibal Mbura R.
Amwimi R.
KORURU
UKAMU
URRECA
TATA
BAKOMBE
MANYEMA
NYANGWE
Luama R.
Kuba R.
Lunde or Luluga R.
Ugarowa R.
Lake Kamolondo
Lake Mofwe
Lake Tanganyika
Lake Albert
UNYORO
Beatrice Gulf
RUANDA
Kitangulé R.
Alexandra Nile
LAKE VICTORIA
Uzige
Ukuma
Kabogo Pt.
URIMBA
UGUHA
MARUNGU
UKAWENDA
Mtambwe
Bitumbi R.
FIFA
URUNGU
Lukuga R.
Lukuga
Mwerú
Bunkeya
Lofoi R.
Lofoi
Kafukwa R.
Kafukwa
Kabogo
Kabogo Pt.
Tanganyika
Mtambwe
Bitumbi R.
Fifa
Urungu

broad billows. The line of rapids occupies a distance of 180 miles, thundering down steep after steep, in a succession of 62 cataracts. Mr. Stanley gives the fall at 585 feet. It took the party five months to pass these cataracts. Here the gallant young Englishman, Frank Pocock, lost his life, as well as fifteen of the men, and Stanley then hauled his boat and canoes on the shore, above the cataract of Isangila. From the rapids the discoveries of Captain Tuckey, in 1816, commence.

We regret that Mr. Stanley should have gone out of his way to assail the memory of Captain Tuckey, especially as his statements respecting Tuckey's map are incorrect. He says that Captain Tuckey "placed on his map, east of Yellala, about E. long., 16° a cataract at a very wide interval from Yellala Falls, with names of places overland as if he had quitted Yellala Falls and proceeded overland as far as the Kwango river." Captain Tuckey did nothing of the kind. The most easterly rapids on his map are west of Covinda, in about 14° 45′ E. longitude; he expressly says that he never got further east than Soondy N'Sanga in about 15° 10′ E.; and he puts no names of places overland to the Kwango river. There is nothing in Captain Tuckey's map and narrative to mislead any one; and the only way to account for Mr. Stanley's extraordinary statement is that he was provided with some incorrect manuscript compilation, and that he had never seen Tuckey's map. Captain Tuckey was a good surveyor and a most accurate and careful observer. The imputations against him are entirely unfounded; and it is the duty of geographers to defend from unjust aspersion the memory of a gallant explorer who died, from exhaustion and illness, in the faithful discharge of a perilous service.

Sir Roderick Murchison, whose forecasts were seldom wrong, inclined to the opinion that the Lualaba of Livingstone was the Congo. We fully discussed the question, arriving at the same conclusion, in our number for September 1872, p. 174. Subsequently, Dr. Behm advocated the same view. Mr. Stanley by descending the river, has established the fact beyond further dispute. The distance from Nyangwe to the mouth of the Congo, following the course of the river, is calculated at 1800 miles. The highest rise of the river was from the 8th to the 22nd of May. The depth of the rise in the broad parts was about 12 feet, and in the narrows from 20 to 50 feet. Ivory is described as being very abundant, and there are extensive groves of oil palms.

Mr. Stanley was navigating the Congo for nine months, from the 5th of November 1876 to the 11th of August 1877. The difficulties which were encountered and overcome were extraordinary. Dangers in every form were met with intrepid resolution. Marvellous resource and ingenuity were exercised in combating the great physical obstacles, still more in resisting the incessant attacks of the savages. The achievement thus done was of the highest geographical importance, and places Mr. Stanley in the first rank among African discoverers. Captain Purvis, of H.M.S. 'Danae,' placed H.M.S. 'Industry' at the explorer's disposal when he arrived at Loanda, and he and his African followers arrived in her at Simons Bay on the 22nd of last October, proceeding thence to Zanzibar, on the 6th of November.

A DESCRIPTION OF THE ISLAND OF FORMOSA.

WITH SOME REMARKS ON ITS PAST HISTORY, ITS PRESENT CONDITION, AND ITS FUTURE PROSPECTS.

(Continued from page 296 of our last number.)

THE present condition and future prospects of Formosa furnish a topic of great interest. From early days the stories of its riches have attracted many emigrants, and the flat portion of the country is now thickly populated. The cultivation of rice may be said to be perfect. The systems of irrigation are not the result of individual exertions, where each man works for himself, but are clearly the work of large bodies of the inhabitants working for the common good, probably at the instigation of the local Government, and certainly under the direction of good masters. Under the stimulating effect of foreign connections, the trade of the island, by no means despicable to begin with, has been more than doubled in ten years. Not only have old industries flourished, but new ones—pre-eminently tea-cultivation—have been created, and the general state of the Chinese portion of the island may be described as prosperous. Some details as to the trade of the last few years will be interesting.

According to the consular reports for 1874, the total trade of Formosa in foreign vessels was:—

	1873.	1874.
Imports	£602,012	£680,340
Exports	485,259	594,431
Total	£1,087,271	£1,274,771

The total value of later years is not yet published. By far the most valuable of the imports is opium, two-thirds of the total value being due to this drug. Next in importance come cotton piece goods and woollens. The total number of pieces of all descriptions imported was 88,523 in 1873, and in 1876 the number had risen to 146,507.

Among the exports, tea, camphor, and coal at Tamsui and Kelung, and sugar at Taiwan-fu or Takow, account for almost the total value. The quantities, as stated in the *Customs' Gazette*, are as follows:—

	1873.	1874.	1875.	1876.
Tea, piculs*	15,610	24,610	41,573	58,905
Camphor, piculs ...	10,755	12,080	7,139	8,794
Coal, tons	45,177	15,221	27,665	31,593
Sugar, piculs ...	402,857	686,220	487,084	879,943

In addition to the above, some small quantities of tea were shipped at Taiwan-fu, and of sugar at Tamsui; but the amounts were quite insignificant.

There are no statistics of the trade in native vessels; but the foreign Commissioner of Customs, in his report for the year 1875, states that during the year 15,000 tons of coal were exported from Kelung in junks, and that there were exported by similar means from Tamsui 210,000 tubs of indigo, value $2,520,000, and 160,000 piculs of rice, value $320,000, besides minor exports. The amount of rice exported from the coast is enormous. So far back as 1834, it was estimated that 200 junks were employed in this trade. I do not know of any reliable estimate of recent date,

* A picul is 133⅓ lbs. avoirdupois.

but merchants talk of the large number of junks so employed. In 1872 the crop of rice failed, and rice had actually to be imported. It is not likely that this will occur again, as year by year the cultivation, already good, is becoming better and more extended.

The statistics of trade given above are most encouraging, and it is certain that the limit of prosperity has not been reached. There is still room for much improvement, and there is every reason to expect that the next ten years will see as great an advance as the last ten. The island has, ever since its acquisition, been considered part of the Fokien Province. The Governor-General who rules over that province ought to visit the island once every three years. His visits, however, have been irregular.

Ting, lately Futai of Foochow, has been appointed Governor of Formosa, and it is said that he is anxious to have the island made into a separate province, and himself appointed first Governor-General. Ting is a most enlightened Chinaman. He has a considerable knowledge of foreign manners and customs, and is ready and willing to introduce foreign improvements. He has a little of the jealousy of foreigners which is universal among the higher class of Chinese; but he has much less of it than Li Hung Chang, and most other high officials. It is a little difficult to describe the exact position of these men with regard to progress. Perhaps the nearest approach to a correct description would be to say that they are pro-foreign and anti-foreigner. To any one coming from Europe, accustomed to hear of Li Hung Chang as the champion of progress in China, it sounds strange and inexplicable to hear residents in China talk of his anti-foreign tendencies. Men of his stamp would like to have steamers and railways, but detest foreign steamboat or railway companies, and, if they had the choice of steamers and foreigners, or no steamers and no foreigners, would not hesitate a moment to choose the latter. Progress they are in favour of, but China unassisted cannot progress quickly, and slow progress without foreign assistance commends itself much more strongly to these people, than quick progress where foreigners are the moving spirits. Under Ting as Governor, or Governor-General, there is, therefore, more chance of a province progressing quickly than under most men; but there is another reason to hope for quick progress in the case of Formosa.

Although a governor-general of a province has a great deal of power, he is not absolute ruler, and has to apply to Pekin for permission to make radical changes in his province, or to carry out any important work, and further, he has to report all that occurs to Pekin; and even in those cases where special permission may not be required, the Imperial Government may consider that the provincial governor has acted imprudently, and may remove him and substitute another who will rule more in accordance with their views.

There seems, however, to be an understanding that Formosa is to be managed differently from the mainland. It is separated from China proper by 120 miles of sea, and it is thought that it is a suitable place for experiments. If these experiments lead to any bad result, it will be annoying, but will not be ruinous. The Customs' reports for 1875 contain a most interesting and able account by Mr. Brown, of Takow, on the advances that are being made in the way of constructing roads and improving the administration of the southern provinces, and the report of Mr. Hobson deals fully with the origin and progress of the mining scheme referred to in the earlier part of this paper.

Ting, since his appointment, has been making inquiries as to the cost of railways and telegraphs. The time has hardly come when works of that description in Formosa can be expected to give a direct return commensurate with the outlay, but if the Government can spare a little money now and again to construct roads, bridges, and, if possible, railways and telegraphs, the effect will be immediately seen in the Customs' returns, which are the best indications of the prosperity of the island.

Since the above was written a memorial from Ting has appeared in the *Pekin Gazette* (translated in Shanghai 13th June 1877), asking permission to make alterations in the assessment of various districts of the island for two reasons: first, the inroads of the sea, floods, and other natural causes, have in many cases considerably altered the area and value of the districts; and, secondly, the increased value of recently-established prefectures has made the weight of taxation bear most unequally on the various inhabitants. Certain new prefectures are double the area, and pay half the tax, of certain older ones, though now both new and old are equally well and fully cultivated. He also asks permission absolutely to abolish a certain class of petty imposts of very old standing, which bring little to the revenue, and press heavily on the people, more particularly as additional amounts are extorted from the people under cover of these taxes by the local mandarins and middlemen. He observes that the increasing customs and lekin duties may be counted on to recoup the treasury for any loss they may incur by these changes. The testimony of all who know China well, whether they belong to the commercial or official class, is so unanimous to the effect that stubbornness, stupidity, and conceit are among the most marked characteristics of the Chinese, that there is no escape from the conclusion that their views are correct—still, if even one man can be found who looks for an increase of revenue through abolishing oppressive taxation, and if the Government show their appreciation of him by appointing him to a high office, the state of China cannot be absolutely hopeless.

Two or three of the present industries offer splendid fields for foreign enterprise, if reasonable facilities are granted. The cultivation of tea might be extended to an unlimited extent, and the example of India leads one to suppose—I might almost say proves to one—that the value of the leaf might be increased twofold. The cultivation has been fostered by foreign intercourse, and foreigners take a more active part in its preparation for the market than they do on the mainland of China; but the tendency at present, unfortunately, is to assimilate the practice to that of the mainland, and not to that of India. The tea in Formosa is grown in very small lots, and the growers have not sufficient capital to cultivate it so as to give the best results, even if they had the knowledge of how it should be done.

Indigo also appears to offer an opening for foreign enterprise. The 210,000 tubs exported from Tamsui in 1875 were valued at $2,520,000, or $12 per tub.

Estimating the weight of a tub at 3 cwt. this would give $4 per cwt. The indigo imported into England must be worth about 30*l.* per cwt. In the consular report for Tamsui for 1871 an analysis of Formosan indigo is given, copied from the *Chinese Recorder* for July 1870. It is as follows:—Water, 5; sand, 1; carbonate of lime, 1; indigo, 1. Assuming the colouring matter of the Formosan indigo to form one-eighth of the whole weight, and the colouring matter of that imported into England to form half of the weight, these prices give $32, or 6*l.* 8s., per cwt. as the price of the colouring matter in one case, and 60*l.* in the other. Surely there is a sufficient margin here for profit. Formosan indigo in its present state is quite unsaleable in England; but judging from the fact that it is found remunerative to print goods in England in a way to resemble indigo printing, it is probable that if Formosan indigo were improved, it would find a market, even if it were not as good as Indian indigo.

Sugar may also offer some slight inducement to foreigners. As far as I could judge from all I heard and saw, there is not much room for improvement in the growing of the cane. The preparation of the sugar is, however, imperfect in the extreme. The mills are very primitive. The cane has to be passed twice through the rollers, and even then all the juice is not extracted. The natives have got into the habit of adding much more lime than is necessary in the boiling, and the resulting sugar contains a large quantity of it, and soon destroys the charcoal in the refineries. From the moment, then, that the cane is cut, the whole process is open to great improvement. Some attempt has been made to introduce sugar-crushing machinery, and there are two Glasgow-made crushing-machines on the island. They are, however, very small, and actually in some respects inferior to the ordinary mills of the country: they consequently have not been favourably looked upon. If powerful steam-crushing machines were introduced, they would effect a great change, and, under foreign supervision, the crystallised sugar would contain much less dirt than at present. On the whole, however, sugar preparation offers a better field to the native than to the foreigner; and at least one really wealthy Chinaman has offered to buy a good steam sugar-crushing machine, if it can be shown to him at work. As this man has lately paid $500,000—or, say, 100,000*l.*—towards a fund for making roads, &c., without apparently losing his reputation of being the richest man in the island, he is well able to undertake the introduction of improvements on a large scale if he likes.

Of new industries, the most hopeful appears to be coffee. There can be no reasonable doubt that on the southern hills it might be cultivated to a profit; but it is almost a certainty that nothing can be done, unless sufficient facilities are granted to induce the investment of foreign capital.

I must now refer to minerals. The mineral wealth of Formosa has always been spoken of as immense, and, before visiting it, I had seen specimens of iron-stone and other minerals which had undoubtedly been found on the island. It is, therefore, certain that some useful minerals do exist there, and it is not improbable that in the savage country there may be large and valuable mineral districts. I believe, however, I am correct in saying that absolutely nothing is known of them. There is a story current among the Chinese that there is a jade mountain in Formosa. The existence of this mountain was never believed in by foreigners, but a report came to my ears through a foreign channel that mercury was to be found on the island. I mentioned this to the mandarin who has lately been sent to take charge of the sulphur mines, and asked him if he knew anything of it. He is a man of considerable attainments and high position, and his knowledge of the English language and long connection with foreigners have given him opportunities of learning much that most Chinamen are ignorant of; nevertheless his answer was—"Yes; it is seen to glitter on the mountains." Such an answer not only proved that he was utterly ignorant of the whole subject, but showed clearly that one must be careful in accepting vague statements on such matters, even if they come from apparently good sources.

Some valuable minerals are by no means attractive in appearance; but galena, copper pyrites, gold, and many others have such distinctive characters, that specimens are sure to be picked up by the natives of any country where they are to be found; while the weight of ironstone of all descriptions, of tinstone, and of other metallic ores is likely to attract attention. I took every opportunity of inquiring whether any of these were known to exist; but no one resident in the island, either Chinese or foreigner, could produce a single specimen, with the exception of Mr. Tyzack, who kindly supplied me with a nodule of clay iron-stone. It was of poor quality, but he had been able to find nothing better.

Coal, sulphur, and petroleum are the only mineral productions whose existence in considerable quantities has been proved. The coal will probably continue to be worked by the Government, and the sulphur, as I have already stated, will certainly (and I think quite properly) be kept in their own hands for the supply of their powder-mills. Petroleum exists about 10 miles south-east of Oulan. Some years ago the right of sinking wells was granted to some foreigners, and the petroleum obtained was stated to be worth 15*l.* per ton; but this grant appears to have been withdrawn. Of the rights of this case I know nothing, but I was told by some of the high officials in the island that they intended to work the wells themselves, and since leaving I hear a report that they have sent for an experienced man from America to take charge. At the present moment, then, minerals do not offer as great inducements to foreigners as tea, coffee, or indigo.

If, however, Formosa is not an El Dorado, it is an island whose future promises to be a bright one. Richly endowed by nature, it is greatly favoured by its insular position. The Chinese, always averse to change, are anxious that Formosa should form an experimental province, and are prepared to remove restrictions there, which for the present they seem inclined to continue on the mainland. Sufficiently supplied as it is with labour at a reasonable rate, and inhabited by a healthy and industrious people, it presents a splendid field for commercial enterprise.

The question has often been asked, Should such an island be left in the hands of such a government as the Chinese? To argue for a moment that the Chinese Goverment is in any respect superior, say to the British, would be ridiculous, but to suggest that

therefore the Chinese should be deprived of part of their possessions is highly improper. Their sovereignty over the island is better established than ours was in New Zealand a very short time ago. They are employing their military in making roads through the savage districts, the most effectual way of eventually subduing them, and they seem anxious to develop the resources of the country. In more than one European newspaper there have been suggestions as to annexation, but any attempt at such a thing would, in my opinion, be nothing short of robbery.

G. JAMES MORRISON.

Reviews.

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COLONEL MEADOWS TAYLOR.*

IN Colonel Meadows Taylor we lost a valued contributor to this magazine, who took a special interest in the various Indian Surveys which it has been one of our principal objects to make more generally known and appreciated. His review of Dr. Hunter's *Orissa* in our number for July 1872, and other contributions, show with what keen interest Colonel Meadows Taylor followed the efforts of those younger men who are working for the good of India by accumulating and classifying accurate information. No one would more thoroughly appreciate any successful attempt to illustrate the life and modes of thought of Eastern people, and he showed this in his warm and cordial welcome of Mr. Palgrave's *Hermann Agha* in our number for September 1872. But his loss is more especially felt by us, because we can never again receive that valuable and weighty advice on matters relating to Indian questions, and especially to revenue surveys and to archæology, from which we have often derived such benefit in recent years.

The story of the life of Meadows Taylor is one which it was right to give to the world, for it teaches many lessons—it will cheer and encourage the young and friendless when the difficulties before them seem too great for them to surmount, it will show them that honours and advancement are within their reach, and it will strengthen them in their resolution to deserve success. Such a story will do more good than any amount of general advice or admonition, for it teaches by example, and proves how certainly a life of steady and resolute perseverance in the path of duty will be rewarded. For Meadows Taylor was not one of those men who have gone to India with many introductions, to be pushed forward by relations and by the influence of patronage. No one could have been more friendless, and indeed unfortunate, at the opening of his career. As a boy of fifteen he was sent out to Bombay in 1823, upon a vague and fallacious promise of employment in a merchant's office. When he arrived, the house of business proved to be no better than a shop, and its chief an embarrassed tradesman. The misfortune-stricken boy found one friend, who obtained for him a commission in the Nizam's contingent. All his future advancement was due entirely to himself. But Meadows Taylor was wholly without self-assertion, and those pushing qualities to which the success of many friendless men is often due. To those who knew him, and to those who read the story of his life, his modesty and single-mindedness are the qualities which are most prominent in his character. He used the talents which God had given him to the utmost of his power for the good of the public service, without one selfish end, and without a thought as to whether he was more or less gifted than his neighbours. Yet he was endowed with rare gifts of imagination and memory, steadied by habits of self-control; and his ability was accompanied with prudence and sound judgment.

No man could have been better suited to fill the extremely difficult post of Resident, and virtually of administrator in a remote and somewhat turbulent native State. In this capacity he worked for many years at Shorapur, in the Deccan; and while maintaining the dignity and superiority which were called for by his position, he ever had a warm sympathy for the people, and treated them with respect as well as kindness, so that he won not only their esteem but their love. No Englishman in India was ever more beloved by the people among whom he worked; and certainly the successful administration of a State like Shorapur, where every branch of government must be undertaken by one unaided man, requires very exceptional qualifications. Colonel Meadows Taylor was an excellent linguist; he acquired a considerable knowledge of law; he studied botany and geology, because he observed the direct bearing of those sciences on the productiveness of the soil; and he taught himself the science of engineering, in order that he might design and execute important works of irrigation. Above all, he was richly endowed with imagination, without which there cannot be a good administrator, especially when dealing with people of a different race. Indeed, it is not too much to say that all his other acquirements would have been little worth, if the gift of imagination had been absent.

Those fascinating pictures of native Indian life with which Meadows Taylor enriched our literature are due to the same faculty which enabled him to advance the moral and material well-being, while he won the love and respect, of the people who were placed under his charge. His earliest work has stood the test of time, and the *Confessions of a Thug*, in which the manners and superstitions of the people of India are portrayed with wonderful fidelity, still retains its reputation. But his later romances, designed to mark the principal epochs of Indian history, have exercised an equally fascinating power over their readers. *Tara* is intended to give a picture of the rise of Mahratta power, and describes, as no history can do, the ways of life and modes of thought of the different races of the Deccan two centuries ago, and vividly brings home to the reader not only great historical events, but the scenery amidst which they were enacted. *Ralph Darnell* portrays the events in the days of Holwell and Clive in Bengal; *Tippoo Sultaun* introduces us to the great events in Southern India in the time of Cornwallis; while *Seeta* treats of the terrible period of the mutinies in 1857. They form a complete work in themselves, and Mr. Reeve

* *The Story of My Life.* By the late Colonel Meadows Taylor, Author of "Confessions of a Thug," "Tara, a Mahratta Tale," &c. Edited by his Daughter, with a Preface by Henry Reeve. Two vols. (Blackwood, 1877.)

truly says that they deserve to retain a lasting place in English literature.

When Meadows Taylor left Shorapur, in 1860, he took away with him the love and regret of a whole people, and, to his last hour, the memory of his long and useful service in that little State must have been a source of satisfaction and happiness. His departure was the occasion of an address from 990 of the principal inhabitants, in which they enumerated all the benefits he had conferred upon them. "None of them," he tells us, "had been strangers to me; many had grown up from children under my sight, and had now children of their own about their knees; others were old and grey-headed; and many whom I had known had gone to their rest. It was not an easy task to leave them all, and I do not think I am forgotten there even now. I intended to depart quietly in the night; but the people were assembled in the streets; there was a sad wailing of women, while the men walked by me in utter silence. Now and then some one would exclaim, 'We have no one now to care for us; but our women will sing of you as they grind corn in the morning, and will light their lamps in your name at night. Come back to us; oh! come back!' People ask me what I found in the natives to like so much. Could I help loving them when they loved me so? Why should I not love them? I had never courted popularity; I had but tried to be just to all, and to secure to the meanest applicant consideration of his complaint by allowing unrestricted communication with myself."

He had ruled over 36,000 square miles of area, and a population of 5,000,000 of people, and gained a place in their affections and respect by no other means than by exercising simple courtesy and justice to all.

The justification of England's Empire in India is that she sends men like Meadows Taylor to bear rule there.

His last years, after returning home, were passed very happily with his family, and he was much occupied in literary work. He paid one last visit to India, and died, on his way home, at Mentone, on the 13th of May, 1876.

UPPER EGYPT.*

EGYPT is a country which, from its eventful history and the astonishing antiquity and magnitude of its monumental remains, must always command the attention and interest of educated men, while its geographical position and capability of development may not improbably obtain for it a high importance in the world's future annals. This future is one in which Eglishmen must feel increased interest, so long as Egypt affords the shortest route to their Eastern Empire. And amid much that is ephemeral in the literature descriptive of Egypt, it is pleasant to light upon two works, dissimilar indeed, but both the fruit of close observation, based on continued residence in the country.

Of the country life of the Egyptians we have long wanted some full and trustworthy description. Lane's accurate and picturesque work deals chiefly with the people of the capital, and it was much to be wished that some one living on terms of intimacy with the people as one of themselves should do for rural scenes the same as Lane had done for those of Cairo. Dr. Kluuzinger's work has admirably supplied this want. As an inhabitant for several years of the little upper-Egyptian sea-port of Koseir, on the Red Sea, as a doctor, Government official, and naturalist, he has had ample opportunity for thoroughly studying the language, and for becoming acquainted with the country and the people. As Dr. Schweinfurth, in an able preface, puts it, "Among fishermen and mariners, among pilgrims and camel-drivers, among petty dealers and lowly scribes, our friend of humanity has sacrificed the best years of his life." The same authority pronounces that Dr. Klunzinger's work will be in future an indispensable addition to the library of every Nile tourist, however small it may be.

The book is divided into seven chapters, the first being devoted to a description of four days in a country town, the second to the incidents of travelling by land and river, and the next to working days, holidays, and days of mourning. Then follow a description of the desert, and a caravan ride through it; two chapters treat of the Red Sea, and its natural features and treasures; and the last deals with popular beliefs and superstitions. The scenes of Egyptian daily life and the types of the populace are most minutely drawn. The author does not attempt to draw judgments or conclusions, but simply to portray facts, and in this task he has been undeniably successful. We gain an insight into Egyptian character, idiosyncrasies, and institutions, which convey a most interesting and vivid picture of the people and country. Among other things, the reader will gain an exact notion of the institution of slavery, such as it exists in Egypt; how far it is engrafted in the ideas of the people, and what efforts have been made for its abolition. Whole caravans of slaves, it appears, are confiscated from time to time, and the slaves escorted to the capital, where the Government takes charge of them, the boys being generally turned into soldiers, and the girls sent into service. But as it is often a great misfortune for the foreign bird suddenly to gain its liberty in a strange land, the author points out that anti-slavery societies, *per se*, are not sufficient, but that humane societies should be formed for the purpose of sending back to their native lands those who have just been made free. Although slavery is still connived at by the lower Government officials, the vigilance of the higher authorities has done much to put down its abuses, as every slave reporting himself to the police at once becomes free. Another special feature of Dr. Klunzinger's work is the information he gives us regarding the Copts, or Egyptian Christians, of whom Lane has failed to afford us a sufficient account. We feel tempted to dwell on the description of the Coptic mass and its ritual, the relations between the Moslem and the Copt, the worship and the every-day life of the former. But, in truth, it is impossible, within the limits of a brief review, to convey a just notion of this work, which owes a merit, which will, we prophesy, receive a sure and ample acknowledg-

* *Upper Egypt: Its People and its Products.* By C. B. Klunzinger, M.D. With a Prefatory Notice, by Dr. George Schweinfurth. (London: Blackie, 1878.)

The Monuments of Upper Egypt. A Translation of the *Itinéraire de la Haute Egypte* of Auguste Mariette Bey. (London: Trübner, 1877.)

ment, to the scrupulous fidelity of a series of innumerable and varied pictures of Egyptian life in all its phases.

The monuments of the country have, of course, formed the subject of a number of treatises of a more or less exhaustive character. Mariette-Bey's little work (which has been excellently translated by M. Alphonse Mariette, of King's College, London) is designed to supply such information as will enable the traveller to understand the meaning of the monuments. Our only regret is that the author has not extended his researches so as to include the wonders south of Philæ, which forms the limit of his investigations. But as far as the region to the north is concerned, he has supplied us ably with a general account of the history, the religion, the language and writing, and the general architectural and monumental features of the Egyptian structures, followed by a detailed description of the monuments of each locality. We very heartily second his earnest appeal to travellers of all nationalities to aid in protecting the monuments from further mutilation and defacement. We have only to remark in conclusion that with his general subject Mariette-Bey appears familiar, both from his personal researches and the study he has evidently devoted to such works as those of Wilkinson, Brugsch, and Birch; and that the information has been carefully condensed within a volume of very handy dimensions.

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INFORME DE LA EXPLORACION DE LOS RIOS PERENE Y TAMBO. Presentado al Señor Ministro de Gobierno y Obras Publicas, por *Arturo Wertherman*, Inginiero de Estado. (Lima, 1877.) Pp. 48. Map.

THIS is a valuable Report, by Mr. Wertherman, to the Peruvian Government. Mr. Wertherman has already done much valuable geographical work in exploring the Peruvian tributaries of the Amazon, which we have noticed in our numbers for October 1873 (p. 267) and December 1874 (p. 388). He was a member of the Hydrographic Commission, under Admiral Tucker, and he himself explored part of the Huallaga and the Pongo de Manseriche. He also fixed numerous positions astronomically, in the departments of Loreto and Amazonas. In his present report he gives an account of an adventurous and successful descent of the Rivers Perene, Tambo, and Ucayali, in specially constructed *balsas*. In October 1876, Mr. Wertherman, accompanied by the French minister, Comte d'Aubigny, reached the confluence of the Rivers Chanchamayu and Paucartambo, where he found two companies of infantry, under Colonel Don Francisco La Rosa, engaged in making a road to the point of embarcation. On the 20th of October they began the construction of the *balsas*, or rafts, and, on the 3rd of November, the Expedition started. It had been joined by Mr. Henry Whitely, an English naturalist, and was thus organised. The canoe 'Pardo,' under the command of Mr. Wertherman, with a crew of four young boatmen from Chasuta, on the Huallaga, led the van. Next came the 'Pichincha,' under Toribio Cruz, next the 'Junin,' under Mr. Whitely, and last, the 'Prado,' under Captain Tirado. The voyage was successfully performed, and the Expedition reached Sarayacu, on the Ucayali, on the 17th of November. In his report Mr. Wertherman gives details respecting the currents of the rivers, the navigation, the wild Indians, and the meteorology. He observed for latitude and for longitude by chronometer at numerous points, and also for the variation of the compass; and his report is illustrated by a map of the Rivers Perene and Tambo.

Log Book.

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The Dutch Arctic Reconnaissance.—In the *Threshold of the Unknown Region* (commenced in our number for July 1873), the object of which work was to advocate the despatch of that English Arctic Expedition which returned last year after achieving a memorable success; we also urged upon the Dutch people the duty of resuming their Arctic enterprises, and, reviving the memory of former achievements, of once more taking their place among Polar explorers (p. 53, 4th edition). Those words were not spoken in vain. The people of Holland went to work in the right direction, steadily and methodically. In 1875 Lieutenant Koolemans Beynen was sent to learn ice-navigation under Sir Allen Young, in the 'Pandora,' and he made a second cruise to Smith Sound in 1876.

The next step was to form a Dutch Arctic Committee, which has been preparing the way for a further advance during the present year. At a meeting of this Committee, which took place at the Hague on November 17th, it was resolved to despatch a small sailing vessel in May 1878, to make a summer cruise in the Spitzbergen and Barents Seas, and thus form a school for Arctic sailors, who will, in due time, carry forward across the threshold of the unknown the glorious old banner of Barents and Heemskirk.

A new schooner is to be built at the wharf of Huijgens and Meursing, at Amsterdam, strengthened and fortified for navigation in the ice. She will be of 85 tons burden, with three water-tight compartments, an outside planking of very hard wood, great strength of beam, an overhanging stem, a spare rudder, and will be further strengthened by iron platings round the bows. As a necessary precaution, she will have eighteen months' provisions on board, and all necessaries for an Arctic winter, although a summer cruise only is intended. The crew will consist of twelve men, all told, and the vessel will be schooner-rigged, with a flying square foresail. Although the trip will be a private undertaking, the commander will be a naval officer, Lieutenant (*1st classe*) A. de Bruyne, and there will be two junior officers under him, one of whom will be Lieutenant Koolemans Beynen.

Thus, after an interval of a hundred years, the Dutch tricolour will once more be carried across the Arctic circle. It is worthy of special remark that this cruise is not paid for by the Government, nor by a few wealthy private gentlemen, but by the voluntary contributions of the whole people of Holland. It is the Dutch nation, with the approbation and support of the royal members of its beloved House of Orange, which now re-enters a field where in former days it won imperishable renown. We heartily wish all success to this well-conceived and carefully-planned enterprise; and we sincerely trust that it will be the commencement of future more extensive work in the field of Arctic research.

Further Results of the Arctic Expedition.—The Fossil Flora.—The valuable scientific results of the Arctic Expedition are gradually becoming known through the preliminary reports, although it will be some time before they are published in their entirety. In our number for August 1877 (p. 213) we

noticed Captain Feilden's paper on the birds, and in that for October 1877 (p. 268) we gave an abstract of those on the mammalia, fishes, crustacea, mollusca, and post-tertiary fossils. A more complete report on the birds was published in the *Ibis* for October 1877 (No. iv.). A very important report on the echinodermata by Dr. Duncan and Mr. Sladen will shortly be published.

Meanwhile, an interesting communication from Professor Heer, of Zurich, was read at the first meeting of the Geological Society on the 7th of last November, on the fossil plants discovered by Captain Feilden, the Naturalist of H.M.S. 'Alert,' in Grinnell Land.

The learned Professor has no doubt that the deposits of lignite found in the vicinity of the 'Discovery's' winter quarters belong to the miocene epoch. This conclusion is arrived at from an examination of the fossil flora. The collection submitted to him consisted of twenty-five species. Of these, eighteen species are known from the miocene deposits of the Arctic zone. The Grinnell Land miocene flora shares seventeen species with Spitzbergen (lat. 78° 19′ N.) and eight species with Greenland, and consequently it most closely approaches the northern Spitzbergen flora. There are two species of *Equisetum*, ten *Coniferæ*, a *Phragmites* and a *Carex*, and eight dicotyledons, namely a poplar, two birches, two kinds of *Corylus*, an elm, a *Viburnum*, and a *Nymphæa*. Among the conifers are the *Torellia rigida*, the *Taxodium distichum-miocenum*, a new species called *Pinus Fieldeniana*, *Pinus polaris*, *Pinus abies* and a spruce. The leaf-covered twigs of *Taxodium distichum-miocenum*, which is one of the most abundant plants of Grinnell Land, appears in many varieties. This remarkable tree, now only found existing in the south of the United States and in Mexico, lived and bloomed, during the miocene period, as far north as latitude 82°.

In Grinnell Land, as in Spitzbergen, the genus *Pinus* possesses the greatest number of species. Professor Heer mentions, as a most interesting fact, that in Grinnell Land two twigs of the fir (*Pinus abies*, Lin.), still covered with leaves, were found; and that this species of fir lived during miocene times in Grinnell Land as well as Spitzbergen, and doubtless extended as far as the Pole, if land then existed so far north. Now the extreme northern limit of this tree is in Scandinavia, in latitude 69° 30′ N. The Arctic miocene forest was, doubtless, inhabited by animals, but hitherto only a single elytron of a beetle (*Carabites Feildenianus*, Hr.) has been discovered, lying with the plants. The presence of a *Nymphæa*, or water lily, indicates the existence of fresh water which must have remained open a great part of the year. Professor Heer remarked that a further investigation of this important locality would, no doubt, produce more animal remains, while it also promises a further rich result in plants. The discussion, after Professor Heer's paper had been read, was very satisfactory; and Dr. Duncan, Dr. Murie, and other eminent men of science bore their testimony to the valuable results obtained by the late Expedition.

Use of Arrows by the Arctic Highlanders.—With reference to the remarks on this subject in our last number (p. 303), it appears from the narrative of the voyage of the 'Polaris' (p. 451), that a party of Eskimo from the western side of Smith Sound, about Cape Isabella, crossed over in an umiak and five kayaks, about five years before the survivors of the crew of the 'Polaris' wintered there in 1872-73. They introduced the use of the bow and arrow. That weapon was not previously used by the Arctic Highlanders, as stated by Kane and Hayes, and in my paper on that tribe referred to at p. 303 of the above number.

CLEMENTS R. MARKHAM.

The Arctic Officers.—A year has now passed away since the return of the Arctic Expedition, with its tale of sufferings nobly borne, of difficulties overcome, and of success achieved. Since then the numerous valuable results have been diligently worked out, and the important volumes which are to record them will soon be published. Meanwhile, the officers who have acquired experience in ice navigation and in sledge travelling, and who are now the hope of future Arctic discovery, are serving in various parts of the world.

Sir George Nares is still busily engaged in the preparation of the history of the Expedition, and Captain Feilden is giving his able assistance in working up the zoological, botanical, and geological results. Captain Markham has just passed through a course of torpedo instruction; Commander Aldrich is in command of H.M.S. 'Sylvia,' surveying on the coast of China; Beaumont is commander of the 'Bellerophon' (flag ship), in the West Indies; and Parr, of the 'Audacious' (flag ship), in China. Lieutenant May is an instructor in the torpedo course, and is attached to H.M.S. 'Vesuvius;' and Lieutenant Egerton is studying at Greenwich, for the torpedo staff, borne on the books of the 'Vernon.' Rawson and Archer are Lieutenants in the 'Alexandra' (flag ship), in the Mediterranean. Fulford is First Lieutenant of H.M.S. 'Hart,' in China; and Conybeare is a Lieutenant on board the 'Raleigh,' in the Mediterranean.

Dr. Colan has just received the appointment of Deputy-Inspector of Hospitals, at Jamaica; Dr. Ninnis is Fleet Surgeon of H.M.S 'Tourmaline;' Dr. Moss is in H.M.S. 'Topaze,' at Kingstown; and Dr. Coppinger in H.M.S. 'Revenge,' at Queenstown. Mr. Mitchell is Paymaster of the 'Wild Swan,' in China. The four engineers are also actively employed. Mr. Wootton is Chief Engineer of H.M.S. 'Gorgon,' tender to the 'Cambridge,' at Devonport; Mr. Cartmel has been engaged in superintending the building of the 'Cleopatra,' at Glasgow; Mr. White is attached to H.M.S. 'Asia,' at Portsmouth, for torpedo instruction; and Mr. Miller is Engineer of H.M.S. 'Bacchante.'

It is the wish of every true geographer that it may not be long before the country again has need of the Arctic services of at least some of these gallant and now veteran explorers.

The Palæocrystic Sea.—M. Eynaud, the French Consul in Crete, in a letter to M. Maunoir, the Secretary of the Paris Geographical Society, has criticised the term "palæocrystic" for the sea of ancient ice discovered by the Arctic Expedition. He observes that the compound χρυστίκη means nothing; and

that from the adjective χρυσταλλος the compound παλαιοχρυσταλλίνη would be perfectly irreproachable. But the term "palæocrystalline" has the inconvenience of suggesting the idea of a cut glass, rather than that of an ancient mass of sea ice. He thinks that derivatives from the synonym παγος or παγετος are preferable. The adjective of παγος is παγωδης. This, again, is objectionable, as suggesting the idea of a Chinese pagoda. But though παγητιχος is not used in ancient Greek, it is in conformity with the rules of Hellenic derivation, in the same way as παθητιχος correctly comes from παθος. He, therefore, submits that the form which best combines convenience with accuracy is "palæopagetic"—the "Palæopagetic Sea."

Captain Wiggins.—In our number for March 1877, Captain Wiggins gave an account of his enterprising voyage to the Yenisei, where he had left his steamer, the 'Thames.' In the month he set out overland to join his steamer, accompanied by Mr. Henry Seebohm, of Sheffield. His intention was to bring the 'Thames' home again with a cargo, but we regret to hear that he has been unsuccessful. When the river-ice broke up, the vessel lost her rudder and sprang a leak, in latitude 66° 30′ N. She, however, was taken about 150 miles lower down the Yenisei, where she ran on a sandbank and was finally lost. Mr. Seebohm had had a schooner built at Yeniseisk, called the 'Ibis,' which they were towing at the time the steamer ran aground. In this vessel they sailed down the river for 700 or 800 miles, reaching 71° 30′ N., but were still 200 miles from the mouth of the Yenisei. Mr. Seebohm sold the 'Ibis,' to M. Sideroff, and she has since made a successful voyage, arriving safely at Vardö, in Norway. Mr. Seebohm returned home by land.

England and Peru—In her commercial relations with Great Britain, Peru always has a considerable balance to her credit. From January to July 1877 the value of the guano exported to England was 1,254,270*l.*; of the nitrate, 549,628*l.*; of the wool, 255,896*l.*; of the sugar, 1,207,200*l.*—total 3,226,994*l.*; while the imports from England only reached a value of 411,061*l.* The large credit with England serves to pay the differences existing against Peru in her accounts with other countries; for she has a deficit in her accounts with Chile, the United States, &c. The consumption of guano has decreased in Great Britain to the extent of 170,396*l.*, as compared with the first half of 1876. The consumption of nitrate has also decreased to the alarming extent of 612,085*l.* But the exports of wool and sugar have increased by 72,904*l.* and 480,225*l.* respectively. One satisfactory sign is that the imports have decreased enormously since 1873. Economy and prudence seem gradually to be taking the place of waste and extravagance.

Death of Professor Orton.—We regret to have to announce the death of this distinguished explorer, whose previous labours in South America were noticed in our numbers for August 1873 (p. 213) and February 1874 (p. 474). His last visit to Peru was undertaken with the object of exploring the important tributaries of the Beni, especially the Madre de Dios and Ynambari. He was a member of the Vassar College (New York), and had made two previous journeys in South America, with valuable results. On this occasion he had entered Moxos, and had penetrated as far as Trinidad, taking numerous hypsometrical and other observations. But he appears to have returned, owing to ill-health, and died at Puno, or (as one report says) on board a steamer while crossing Lake Titicaca. He was buried on a small island in the Bay of Puno.

Don Francisco P. Moreno.—The Report on the exploration of the River Santa Cruz, in Patagonia, by Señor Moreno, which we published in our number for August 1877, p. 209, is not the first valuable contribution to geographical knowledge which has been made by that eminent explorer, whose principal object has been the collection of anthropological data. In 1873 he made a journey to Carmen, and in 1875 he visited the Lake of Nahuel-huapi, one of the sources of the Rio Negro. The narrative of these expeditions will be published next year. Señor Moreno then explored the northern provinces of the Argentine Republic, with the object of collecting antiquities for comparison with those he had obtained in Patagonia. He was so fortunate as to obtain 300 specimens of pottery and worked stone, including figures of lizards and of human beings. In October 1876 he proceeded to the Patagonian coast, and made further collections at Chupat and Port Desire, before commencing the exploration of the Santa Cruz. He has discovered traces of the existence of a race in remote times, quite distinct from those which now inhabit this region. He has a collection of 400 crania of all types, ancient and modern; and he has found that a dolicocephalic race lived in Patagonia in ancient times, which was succeeded by the present brachycephalic race. He considers the dolicocephalic people to have been the primitive race of America. Some of the crania are so ancient as to be half-petrified, and some of them resemble that of Neanderthal.

Señor Moreno has presented his extensive anthropological, zoological, and palæontological collections to the Argentine people, to form the nucleus of an Anthropological and Archæological Museum at Buenos Ayres, which is about to be founded with the distinguished explorer himself as Director. His collection consists of more than 400 skulls of the different races which have peopled the Argentine Republic, and a great number of objects of stone, clay, and of weapons, among them 4000 arrow-heads worked by the ancient Patagonians. Señor Moreno intends to prepare a duplicate collection for the Anthropological Institute of London.

Portuguese African Exploration.—The Portuguese Expedition will leave the west coast at the mouth of the River Cemene, and will explore that river to its sources. At Bihé it will receive some reinforcement, and thence it will proceed to discover and explore the Cubango, the source of the Quango, and the Mossambo Range; then striking the upper Zambesi, and ascending that river to its sources. It will then enter the lake region, make the circuit of Lake Bangweolo, strike thence to the Nyanza, cross that lake, and proceed to Mozambique. It will report upon the most practicable route from the east coast,

and on the commercial relations between the two Portuguese coasts and the rich central region. Major Serpa Pinto will accompany the Expedition, and Mr. Silva Porto, the well-known merchant and explorer, has also offered his services.

The Slave-Trade on the Upper Nile.—A terrible picture of the slave-trade and its attendant horrors about the region of the Bahr-el-Ghazal is given in the *Exploratore*, a new monthly journal, published in Milan. The writer of the letter is one of Gordon Pasha's Expedition. He remarks:—The chief *Seribas* on the Bahr-el-Ghazal, which form stations for the slave and ivory trades, are twelve in number. Besides these, there used to exist two others, since abolished by Zevir Bey, who, after being made *Mudir* of Shakka, refused to keep up the force necessary for the maintenance of these seribas, and obtained all the ivory that he had to remit to Cairo by violence from the natives. Each seriba has attached to it from 150 to 200 soldiers, two-thirds of whom are armed with guns, and the rest with lances. In their expeditions, which last from six to seven months, they are commanded by a Vekil, or agent of the proprietor, and an officer, and are accompanied by a standard-bearer and trumpeter. Every soldier contracts for a year, with the option of renewal, if both parties consent. These are expected to support and clothe themselves, their pay being issued to them in kind, viz. cloth, coffee, sugar, tobacco, fezzes, cattle, and slaves. As soon as a village has been captured and sacked, two-thirds of the slaves and cattle fall to the share of the Vekil, as well as all the ivory, and the remaining third to the soldiers. The soldier who thus becomes a slave-owner is allowed to let his slaves out to the seriba, but not to claim their pay. He never engages in hunting, but frequently becomes possessed of ivory, which the slaves convey from the seriba to Meshra-el-Rek, the place of embarkation, without the master reserving any right thereto. It is reckoned that the Vekils pocket from about ten to fifteen times the value of the salaries they pay, while the gain of the soldiers, accruing as it does from the cattle and slaves, prompts them to acts of the most revolting cruelty.

As soon as an expedition arrives at Meshra, the slaves are shut up in enclosures, guarded by sentinels, and are employed in cutting up and smoking beef for the journey. The sufferings and fatigues of the previous journey, the close imprisonment in a small, confined area, the exposure to the tropical sun, and the fearful exhalations from the putrifying meat, and from the unburied corpses of those which have died in their midst, reduces the survivors to mere skeletons.

About the middle of May 1876, these Vekils arrived at Meshra with a great quantity of ivory, having slain entire tribes, reduced to slavery about a thousand women and children, and captured six thousand cattle. Other cruelties are cited by the author, who remarks that his figures are reliable and the facts notorious. The Vekils come chiefly from Khartum, and the soldiers from Dongola. The former arrogate to themselves, in some instances, official permission from the Khedive to collect ivory, slaves, and cattle.

Site of the Battle of the Granicus.—Dr. Henry Kiepert contributes to the *Globus* an account of an examination made by him, in 1842, of the site of the great battle fought between Alexander and the Persians, on the banks of the Granicus, in the year B.C. 334, where the Macedonians were so signally victorious. Herr Kiepert states that his researches had a limited scope, owing to successive downpours, which had made the loam soil of the valley an impassable slough. But he furnishes a sketch-map of the site and its immediate vicinity, and thereon he shows some high ground, abutting on the western bank of the river, which he had little difficulty in recognising as the eminence where the Persians were posted to receive the attack of the Greeks. Dr. Kiepert observed also that the river at the point where he crossed it, Chinar-Kopru (Plane-Tree Bridge), although tolerably wide, was only 2½ feet deep in its deepest part. This, he shows, fully justified the remark of Alexander, that, after crossing the Hellespont, it would be a mighty disgrace to be stopped by "this brook" (*σμικρὸν ῥεῦμα*). Arrian calls this a scornful expression; but, judged by Dr. Kiepert's description, the river must certainly have appeared contemptible. Dr. Kiepert suggests that the vicinity of the spot to the Sea of Marmora, a much-frequented trade-route, might induce some traveller to complete the topographical examination of the battle-field, especially to the west, where he himself was prevented from going.

Correspondence.

—:o:—

THE TURKS OR MAGYARS.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

DEAR SIR,—The conclusion arrived at in my previous letter, that the Magyars were Turks, I deem to be of such crucial importance in elucidating the ethnography of Eastern Europe, that I should like to fortify it with some further facts. Constantine Porphyrogenitus has a curious notice about this region, which becomes very valuable in view of our contention. Speaking of the Pechenegs, he says they at first lived on the Atel and the Geech—*i.e.*, on the Volga and the Yaik, or Ural, and were in contact with those peoples called Mazari and Uzi (*Stritter*, iii. 938). This name Mazari has by some been held to be a corruption of Khazar, while others have seen in it a form of Magyar, a view which, I think, very probable indeed; and, if so, the earliest use of the name Magyar by a Western writer. It is noteworthy that the Mazari are linked together with the Uzi in this passage. Now, it is a curious fact that hardly any of the great migrations of Nomades known to me have been so complete that some portion of the race has not been left behind, and it is interesting to inquire if this was not so in the case of the Mazari or Magyars.

In the east of Russia, and within the borders of the old kingdom of Kazan, there is a well-known Turkish tribe, closely allied to the Bashkirs, which is known to the Russians as the Mescheriaks; while a portion of the inhabitants of the governments of Nishni Novgorod, Pensa, Saratof, Simbirsk, and Tambof still call themselves Mishar. The *ak* in Mescheriak, like that in Ostiak, Votiak, &c., &c., is a mere locative ending. There is still a district called Mestchera, between the Oka and the Upper Sura. This was an independent principality until the days of the famous Dimitri Donskoi, who, we are told, bought it from its prince, Alexander Ukovitch, who had been converted to Christianity

(*Karamzin*, French edition, v., 90). Princes of Mestchersk are mentioned later (*id.* v., 316).

These Mescheriaks are by no means a new people. They are mentioned in the pages of the old Russian chronicler, Nikon, in the MS. History of the Czar Ivan Wassilivitch, who reigned from 1462 to 1505, &c., where their name occurs as Moshars or Mashars (see Veliaminof Zernof, *Untersuchung ueber die Kazimofschen Zaren*, &c., 1, *note* 15); but it occurs even earlier than this, namely, in the pages of Nestor, where they are mentioned as neighbours of the Cheremisses and the Mordvins.

It would seem that, until the seventeenth century at least, they still lived on the Lower Oka, and in the government of Simbirsk. Thence they removed to the neighbourhood of the Bashkirs, in the Southern Urals. M. Vel. Zernof suggests that this migration took place, probably, in the year 1688 (*op. cit.*, i., 145). They speak a Turkish dialect, and greatly resemble the Bashkirs in their manners and customs. They are, however, more cultivated and better Mussulmans than the latter (Muller, *Ugrische Volkstamm*, i., 160).

Fischer, the historian of Siberia, Schafarik (ii., 235), Klaproth, &c., are agreed in identifying the name and people of the Magyars with the Mescheriaks. Most writers also identify them with the Megere, a tribe of the Khazars, mentioned by Constantine Porphyrogenitus.

I read a paper at the meeting of the Oriental Congress at St. Petersburg, on the question whether the Khazars were Ugrians or Turks, and showed that almost all the evidence we possess goes to show that, whatever they may have been originally, that in the days of their grandeur they probably spoke a Turkish language. We know they dominated over the races living in the valleys of the Volga and its tributaries, and were the lords of the Eastern Bulgarians and of the Hungarians before their great migration. If the Magyars were the same race as the Meschera of Nestor, as we have tried to show, they, doubtless, like the other tribes of the Volga, formed part of the Khazar Empire.

Now, on turning to the account of the Khazars by Constantine Porphyrogenitus, we find him saying, that a civil strife having arisen among them, certain of their tribes were beaten, and fled to the Turks, in the Patzinakitan territory—*i e.* in the territory afterwards occupied by the Pechenegs. The names of the fugitive tribes were the Kabari, the Neke, the Megere, the Kurtugermati, the Tariani, the Genach, the Kare, and the Kase (*Stritter*, iii., 312). All these, apparently, were included in the common name Kabari. This name occurs, I believe, now for the first time. It is well known in the legendary history of the Hungarians, under the form Kobor, which was apparently its proper form, and which means a vagabond (Sayou's *Histoire des Hongrois*, 19, *note;* Foldvary, *Ancetres d'Attila*, 184). It is, therefore, a mere translation of the Turkish name Kazak: and it is a curious fact that Kasachia and Kabardah are terms designating apparently the same part of Circassia, as if they connoted the same thing. I look upon Kabari as the generic name given to the whole of the fugitives, and believe that Constantine has enumerated the Kabari as one of the eight tribes by mistake.

Putting aside the Kabari, we have seven tribes left, which have been identified, with great probability, as the Hetu Mogers, or Seven Mogors, of the Hungarian legends. Moger is the Latin form of Magyar, and it will be seen that Megere is one of the tribes mentioned by Constantine, and has been so identified by most critical historians, except a very few patriotic Hungarians. The name Megere is, in fact, as Schafarik has shown, the same in form as the Russian Metchera or Mescera (*op. cit.*, ii., 235, *note*).

Let me now call attention to a fact I have not seen elsewhere noticed. A second of these tribes is called Tarian. Now, in the notices already quoted from the mediæval Russian chroniclers, we find the tribes of Kazan enumerated as the Chuvashes, Cheremisses, Mordvas, Moshars, and *Tarkhans*, and the last name is also written Tarkhon (Vel Zernof, *op. cit.*, i., 145). The Russian writers have passed this name by, with the simple remark that it was a title. It is quite true that Tarkhan was a Mongol title, but it is equally true that in these notices Tarkan or Tark Khan is a tribal name, and its mention with Moshar is very important when we find Tarian, which I look upon as the same name, mentioned with Megeri. Of the other names, Kuturgurmati may be compared in form with Jur*maty* and Chur*mati*, clan names among the Bashkirs (Klaproth, *Asia Polyglotta*, 221). It was probably the same tribe as that called Cutziagiri by Jornandes, and Kutriguri by Theophaner. The other names I should be grateful for some illustration of. I believe that the whole of the tribes which separated from the Khazars were more or less of Turkish blood, and that they have their best representatives in the modern Bashkirs and Meshkeriaks. Constantine tells us they joined the Turks, by whom he means the Hungarians. It may be that this invasion constituted the latter people Turks, for that name was not always applied to them, as Constantine himself says, telling us further they were formerly called Sabarto Asphali.

The Hungarians, who were thus joined by the Magyars, were an old race on the Pontus, and were no doubt the Hunuguri or Onuguri of other writers. Constantine tells us they lived formerly near the Khazars, in the land of Lebedias, which, he says, was watered by the River Khidmas, otherwise called Kingulus. Klaproth argues plausibly that this latter is the same name which Constantine elsewhere writes Syngul, and is the Ingul of our own day, an eastern feeder of the Bug (*Tableaux Historiques, etc.*, 280). A more important river with a similar name is the Inguletz, a tributary of the Dnieper. The probability is, that the land of Lebedias answered largely to the modern Ukraine and Nogay Steppe, between the Bug and the Don and the town of Lebedin, in the government of Kharkof, and that of Lebedean, in that of Tambof, probably retain the memory of the name Lebedias. Klaproth remarks that Lebed means a swan in Russian. I may add that Constantine calls the chiefs of "the Turks" boebodai or voivodes. This word is generally deemed of Slav origin, but M. Horvath claims it as Magyar (Sayous, *op. cit.*, 10, *note* 3). It is certainly curious to find the chiefs of either a Ugrian or Turkish race called by a Slavic title.

Out of the land of Lebedias they were driven by the Pechenegs, and sought shelter in that of Atelkuzu. Klaproth deems this a corruption of Ατελ χαι Ουζου (Atel and Usu).

Atel or Itil simply means river in Turkish, and we find it used in several cases with a qualifying adjective, as Yaik Itil, Tana Itil, Cholman Itil (the Kama), Keskonna Itil, and Orman Itil, in the government of Cherson (D'Ohsson, *Abul Cassim*, 30). In the present case, used alone, it doubtless, as Klaproth and others have agreed, refers to the great Itil, the Danube. The use of the Turkish word Atel in Atelkuzu is a strong corroboration of the other arguments here adduced for making the Magyars Turks.

Klaproth thinks Usu means the Bug, which he says is still called Uzu Su by the Nogays and the Turks of Constantinople. The Dnieper is so called by Sherefuddin and Anna Comnena, but the fact is the Bug and Dnieper may be considered as branches of the same river, both falling into the same long inlet.

Constantine enables us to fix roughly the position of Atel Kusu, by telling us it was watered by the rivers Barukh, Kubu, Trullos, Brutos, and Seretos. The last two are clearly the Pruth and the Sereth, while the Trullos is the Dniester, still called Turla by the Turks (*op. cit.*, 281). Atel Kusu therefore answered to the modern lower Moldavia and Bessarabia

After some years "the Turks" were again driven out,

and their land was occupied by the Pechenegs, who were called Bissi or Bisseni by the Hungarians, a name which seems to still survive in Bessarabia. The outcasts migrated westwards and occupied Great Moravia (*Stritter* iii., 610).

These outcasts consisted, I argue, of the old Unugari or Hungari, who were largely a Ugrian race led by a caste of Turkish Magyars.

That the term Hungarians does not connote in early times the same thing as the term Magyar I have shown in my previous letter. To the facts there quoted I may add that while the Magyars only appear in the west at the end of the ninth century, the Hungarians are known at a much earlier date. Thus, according to Klaproth, we are told, in a curious passage of the Acta Sanctorum, that as early as 750 the Hungarians (*impia gens Hungarorum*) passed the Danube, and advanced as far as the Grisons, where they destroyed the Monastery of Dessertina, founded by Saint Sigebert. In 838 we meet with Hungarians on the Lower Danube. They are then mentioned as allies of the Bulgarians against the Eastern Empire, and are called Ungri or Hungri, and also Hunni and Turki. In 862 the Ungri are found attacking the dominions of Louis the German. This is the first time they are mentioned as invading Germany (Klaproth, *Tableaux Historiques de l'Asie*, 278 and 279). The first appearance of the Magyars proper in history, so far as I know, is in the year 888, when they are named by several Byzantine authors, who, however, like the Emperor Constantine, call them Turks. The Emperor Leo was then at war with the Bulgarians, and we are told he sent messengers to the Turks (*i.e.*, the Magyars), who were then under their chiefs Arpad and Kusan (a variant has Korsan) (*Stritter* iii., 615). Shortly after they accordingly crossed the Danube and ravaged Bulgaria, and, having afterwards defeated Simeon, the Bulgarian King, and made many captives, they sent to the Emperor to ask him to buy them from them, which he agreed to do (*id.*, 616). Zonaras, who wrote, and who seems to have copied, this account, replaces Turks by Ungari, while the Emperor Constantine most incongruously assigns the campaign not to Arpad but to his son Liuntic (*id.*, 615 *note*). At this time, therefore, it would seem the Magyars or Turks were the dominant people north of the Danube and in the country of Atelkusu.

Some time after, Simeon, having made peace with the Romans, allied himself with the Pechenegs and entered into an offensive treaty with them against the Turks. The Turks were very badly beaten and had to evacuate their land, and migrated westwards (*id.* iii., 608), probably to Transylvania. The Frank historians date the arrival of the Hungarians (*i.e.*, the Magyars) in Europe in 889 (*Reginon ad. ann.*). In 892, Arnulf summoned them to his assistance against Sviatopolk, the great King of Moravia. In 893 they invaded Bavaria.

I have shown in my previous letter that the Avars were by no means extinguished by Charlemagne. Eginhardt, in recapitulating the wars of the latter in Pannonia, says merely that all their *nobility* perished and all their glory fled (Eginhardt, vit. *Car. Mag.*, 13). Thierry, *Histoire d'Attila et ses Successeurs* ii., 192). Nowhere do we read that the Avars themselves were destroyed. The war lasted till 803, and its issue is told in the laconic phrase of the Poeta Saxo. Speaking of their Khakan Tudun, he says :—

> "Mutans (Tudun) promissa fidem que,
> Perfidiæ tulerat parvo post tempore pœnas."

Tudun having disappeared, his successor, Zodan, submitted, with his people, to the great conqueror. It is true that Charlemagne nominated five counts, namely, Gontram, Weremhar or Berenger, Albric, Gotfred, and Gerold, to govern the march of Pannonia, and that he subjected "Hunnia" to the ecclesiastical jurisdiction of the Bishop of Salzburg (Thierry, *op. cit.*, ii., 188); but this is very far from saying that the Avars were exterminated. The Khakans still ruled in Pannonia. The one who is mentioned in 805 is named Theodore. He was probably the Zodan above named, under a Christian name. He was succeeded by another Khakan, who was named Abraham, and who was baptized at Fiskaha, in the diocese of Ratisbon (*id.*, ii., 189). This was followed by that of a large number of his people.

The power of the race was, however, much curtailed, and they became to some extent the victims of their Slavic neighbours, over whom they had tyrannized in the days of their prosperity. To escape from these attacks a large number of the Avars determined to migrate south of the Danube, and under their Khakan they asked Charlemagne's permission to be allowed to settle between Carnuntum and Sabaria, on the two flanks of the Cettian Alps. This request was granted them, the district east of the mountains took the name of Avaria, while that stretching from Comagene to the Ens was called Hunnia (*id.*, 193). This migration took place under the Khakan Theodore, who also received permission to retain the same status and dignity in his new quarters which the ancient Khakans had held among the Huns (*Annales Mettenses ad ann.* 805. Thierry, *op. cit.*, 194).

The Emperor Constantine Porphyrogenitus speaks of these Avars as still remaining in Croatia, when he wrote :—"Suntque etiamnum in Chrovatis Avarum reliquiæ et Avares esse cognoscunter" (*Schafarik* ii., 278). It was from them no doubt the Croats derived the Avar title of Ban, and Schafarik argues that the likeness which has been noted between the modern Morlacks and the Kirghises is to be explained by their descent from these Avars (*id.*). The migration, however, was, as Thierry says, not a complete one, and numbers of the Avars remained behind in Pannonia, and fortified themselves in the marshes and other strong positions. In 811 we find three Avar princes, named Cani, Zauci, and Tudun, attending the diet at Aachen, from Pannonia, in reference to the settlement of the boundary between themselves and the Slavs. The Avars took part in 819, in the revolt of Liudewit, and sent envoys, as I have mentioned in my previous letter, to the Emperor Louis in 822. In 826 we find the Pope Eugenius II. addressing a letter to the people living in the Danube valley and to their chiefs, especially to the Khakan Tutundus and to Moimar, the Duke of Moravia (Thierry ii., 195).

This is ample evidence that the Avars remained an important stock in Pannonia long after Charlemagne's wars, and strengthens greatly my contention that they formed a large portion of the Hungarians.

The traditions of the Hungarians confirm this, as the following sentence of Thierry shows. Speaking of their arrival in Hungary at the end of the ninth century, he says :—"Here and there they found scattered over the land sections of the Avars, who could not be indifferent to the arrival of a people related to them by origin and language. The part which these subjects of Tudun could take in assisting the Hungarians in their contest with the Slavs is not clearly shown in history; but tradition affirms that both in Transylvania and elsewhere their co-operation was that of brothers with brothers" (*Attila et ses Successeurs*, ii., 213).

Again, it is curious to find the terms Avar and Hungarian used indiscriminately by some of the early Frank analyists, as in the Fuldensian Annals. Thus, under the year 894, we read :—"Avari qui dicuntur Ungari in his temporibus ultra Danubium peragrantes," &c. (*Pertz*, ii., 410). In 896 :—"Pacem ergo Græci cum eodem anno cum Avaris (qui dicuntur Ungari) facientes," &c. Later in the same paragraph they are called Avars simply. Again, in 900 :—"Interim vero Avari (qui dicuntur Ungari) tota devastata Italia," &c.

On the other hand, we have other proofs that Turkish

tribes formed a part of the later Magyar nation. Thus a section of the Pechenegs, who were called Besseni, were settled on the Theiss and in the county of Wieselburg:—"Dux Zulta fixit metas regni Hungariæ, ... et ex parte Theotonicorum usque ad pontem Guncil. . . . . et in eodem confinio *ultra lutum Musun* (Wieselburg, in Hungarian, Mosony) *collocavit etiam Bissenos* non paucos habitare, pro defensione regni sui, ut ne aliquando in posterum furibundi Theotonici propter injuriam sibi illatam fines Hungarorum devastare possent. . . . . De terra *Byssenorum* venit quidam miles de ducali progenie, cujus nomen fuit Thomizoba pater Urkund, a quo descendit genus Thomoy, cui dux Thocsun dedit terram habitandi *in partibus Remey usque Tysciam ubi* nunc est portus" (*Obad. Notar.*, c. 57; *Zeuss*, 754). Others were planted on the northern frontier, and "villæ Bissenorum" occur in old documents (*Zeuss*, *id.*).

I have already quoted several authorities showing that Magyar and Bashkir were synonyms with the Arab writers. I must quote one from Yakut, who wrote in the 13th century at greater length. I take it from Frœhn's translation, and the narrative was taken down from a Bashkir who happened to be at Aleppo:—"Ego vero offendi in urbe Haleb magno numero genus hominum, qui Baschgurdi audiebant, crinibus et facie valde rubicundis erant et scientiæ juris sacri juxta ritum Abu-Hanifæ operam dabant. Eorum aliquis, quem adieram, de ipsorum patria rebusque percontanti mihi respondit: Terra nostra ultra Constantinopolin jacet in regno alicujus nationis Francicæ (*i.e.* Europæ), cui nomen Hungerorum est. Nos Muhammedis sacra profitentes, eorum regi subditi in tractu regni ejus *quodam trigintu admodum incolimus pagos*, quorum quisque etiamsi parum absit, quin oppidulum referat, rex tamen Hungerorum metu, ne ipsius detrectemus imperium, ullum eorum muris saepiri vetat" (*Zeuss*, 755). This shows that the Bashkirs or Magyars were planted in Hungary much as the Comani were at a later date. I must remark that Ibn Fozlan specifically calls his Bashkirs Turks, and Rubruquis tells us they were shepherds, which also shows they were Turks (*Zeuss*, 748). Masudi, in conclusion, in describing the Western Bashkirs, says they were Turks like the Pechenegs (*D'Ohsson, Abul Cassim*).

I remain, yours respectfully,

HENRY H. HOWORTH.

DERBY HGUSE, ECCLES.

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THE DRAINAGE OF THE YARKAND RIVER.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

SIR,—Reading Major Herbert Wood's paper on the drainage of the Oxus basin in your September number, it occurred to me to compare the figures whch he gives with the approximate ones obtained by me for the Yarkand River, which is fed from the same mountain system that gives rise to the Oxus, but from the drier and more barren side of it.

The maximum flood discharge of the Yarkand River, as roughly determined by me in the end of July 1875, amounted to 68,190* cubic feet per second. This was the quantity that passed the Yaugi-bazàr Ferry, near Yarkand, a point *below* the mouths of all the irrigation channels which fertilise, or, rather, create, the Province of Yarkand. This is, of course, far above the junction of the other rivers of Eastern Turkistàn, which, with the Yarkand River, make up the great Tarîm Gol (so-called). The area of the drainage basin of the Yarkand River proper, down to this point, I make out to be about 17,000 square miles. We therefore get the following comparative table of the proportion of maximum discharge to drainage area, in the several Alpine rivers enumerated by Major Wood, together with two Central Asian rivers:—

Oxus	1·75 cub. ft. per sec.	per sq. m.	of drainage area.
Yarkand River	4·00 (about)	do.	do.
Arve	10 or 11	do.	do.
Upper Rhone.	11·25	do.	do.
Upper Ticino.	11·75	do.	do.

It must be remembered that the figure for the Yarkand River *excludes*, while that for the Oxus *includes*, the whole of the water taken out by the great system of canals which fertilise the Yarkand and the Khiva Provinces respectively. Were the canal water included in the calculation for the Yarkand River, its figure would differ still more from that which represents the discharge of the Oxus. As it is, if we take the average of the maximum discharge of the Alpine rivers (per square mile of area) as 100, the discharge of the Yarkand River would be about 36, and that of the Oxus about 16.

As the rain and other products of precipitation in the Yarkand River basin are certainly less, and not greater, than those of the Oxus basin, the figures above given for the former river seem to corroborate Major Wood's opinion, that we must seek some special cause for the smallness of the Oxus floods. The Yarkand River, with less rainfall, and after supplying water to all its canals, yet brings down floods more than twice as large in proportion as those of the Oxus at a point where the latter is still in possession of all its canal water.

However, it must be remembered that in the long course of 450 miles between the point where the Oxus receives its lowest affluent and the point where its flood was measured, a great deal of water may be lost by what engineers call "spilling," and by evaporation. It is much to be desired, as Major Wood says, that the flood volume of the Oxus should be measured at the point where it ceases to receive any more water from tributaries.

Yours, &c.,

ROBERT B. SHAW.

SIMLA, *October 24th*, 1877.

* This was kindly calculated out from my data by Colonel Gulliver, R.E., Chief of the Panjàb Canal Department.

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THE MARQUIS ANTINORI.

To the Editor of the "GEOGRAPHICAL MAGAZINE."

MONSIEUR,—Le télégramme du *Times*, daté de Rome, suivant lequel notre Société de Géographie aurait reçu la nouvelle de la mort du Marquis Antinori, est contraire à la vérité. La société n'a jamais reçu de pareilles nouvelles. Les lettres envoyés du Cairo par M. Matteucci reportent, il est vrai, le *bruit* de la mort d'*un blanc* dans la bataille où le roi Menelik a été battu; mais les déclarations de M. Matteucci lui-meme et de notre Consul-général demontrent à l'évidence, que dans l'indication d'un nom particulier il n'y a qu'une combinaison arbitraire.

Il faut dire le meme des nouvelles concernant M. Chiarini.

Je vous prie, Monsieur le Directeur, de vouloir bien rectifier dans ce sens le télégramme sousdit, et d'agréer les assurances de ma consideration distinguée.

LE SECRÉTAIRE GÉNÉRAL,

J. DALLA VEDOVA.

ROME, *li 22nd November*, 1877.

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Proceedings of Geographical Societies.

—:o:—

ROYAL GEOGRAPHICAL SOCIETY.

Meeting of 12th November, 1877.

PRESIDENT'S ADDRESS.

THE forty-eighth session was opened under the presidency of SIR RUTHERFORD ALCOCK. In his inaugural address reference was first made to the lectures on Physical Geography, which were delivered during the last session, and which, owing to their success, would be continued for another year. The first, "On the Formation of the Great Land Masses of the Earth," would be delivered by Professor Duncan; the second, "On Terrestrial Magnetism," by Captain F. J. Evans; and the third, "On Plant Distribution as a Field of Geographical Research," by Mr. Thiselton Dyer. The proceedings of the Geographical Section of the British Association at Plymouth, and the principal geographical events that had occurred during the recess, were next touched upon. Attention was then called to the Brussels Conference and the objects of the International Commission for the Exploration and Civilisation of Africa, founded by the King of the Belgians. Concerning this great undertaking, Sir Rutherford remarked that, although it was the natural desire of the British members, geographers, and others invited to the Conference to co-operate cordially in furtherance of its objects, the Royal Geographical Society could not, by its constitution, enter upon any field of operations other than that of exploration. Commercial enterprise, suppression of the slave trade, and missionary or other civilising efforts were not within their province, and must be undertaken by independent agencies. He felt sure that the Society would be gratified to learn that the first Expedition, under the direction of the International Commission of Brussels left Southampton for Zanzibar on the 18th of last month, having for its object the formation of a station at or beyond Lake Tanganyika, with depôts at Zanzibar and Unyamwesi. The African Exploration Committee of the Society's Council had granted the sum of 250*l.* to the Executive Commission at Brussels, and had recommended the Expedition to the Consul-General at Zanzibar, and through him to the Sultan, and also to the London and the Church Missionary Societies, with a view to obtaining a welcome for the Expedition. Sir Rutherford was happy to say that the Brussels Commission already possessed a capital of some 300,000 francs, contributed chiefly in Belgium, and an income of 75,000 francs.

With reference to the action of other countries, the President informed the meeting that France had established a National Committee to co-operate with Brussels, under the presidency of M. de Lesseps, and reminded them of the persevering attempts France had made to penetrate the interior of Africa from the Gaboon, by ascending the Ogowé. The German National Committee had been merged into a "German African Society," distinct from the "German African Society for the Exploration of Equatorial Africa," and was about to despatch its first Expedition, under Herr Schütte, an engineer and scientific topographer, with a view to penetrate the interior from Angola on the west coast. Nothing further had been heard of the Austrian National Committee, since the announcement that it had contributed 5000 francs to the Brussels Commission. In Hungary a separate National Committee had been formed, which had also forwarded 3000 francs to the International Commission. Under the presidency of the Crown Prince Humbert, Italy had held important meetings, and, for the present, it was resolved to devote all support to the Expedition of the Marquis Antinori, who was engaged in endeavouring to penetrate the unknown region lying between Shoa and Lake Victoria Nyanza. Owing to unforeseen expenses and losses, it had been found necessary to despatch one of its members, Captain Martini, to Italy for further supplies, and, in company with Signor Cecchi, he had returned to Zeila re-equipped. The latest accounts stated that these two gentlemen had rejoined their chief, and there were now hopes of the Expedition being able to push on towards the Victoria Nyanza. The Portuguese Government, owing no doubt to the narratives and revelations of Cameron and Young, resolved last year to do something towards the scientific exploration of the unknown regions adjoining their African possessions. A Geographical Committee in connection with the Department of Marine, but distinct from the Lisbon Geographical Society, had been established, and an Expedition was decided upon, the Government granting a sum of 20,000*l.* towards its expenses. This Expedition, consisting of Senhor Serpa Pinto, Senhor H. Capello, and Lieutenant R. Ivens, left Europe last June for Loando. The route decided upon was the ascent of the Cassabi, and the examination of the relations of its basin with those of the Quanza, the Cunene, and the Zambesi, terminating with a journey to the east coast.

The work of the various Missionary Societies of Great Britain in the exploration and civilisation of Africa was next reviewed. The French Société de St. Esprit had a mission established at Bagamoyo, on the east coast. In 1871, when Stanley arrived on his first expedition in search of Livingstone, he found there ten Padres and a like number of Sisters of Mercy. He was most hospitably received, and reported that not only had they founded a mission, constituting a village of sixteen houses, some solidly built, but schools, at which 200 boys and girls were under tuition, while the influence of the mission was considerable, and eminently beneficial to the surrounding native population.

In addition to all these workers in the missionary field who were aiding geographical exploration, there were many travellers who might not lay claim to the title of geographers, but from whom useful information was often derived in the field of African exploration. The German Geographical Society of Berlin held a meeting a few months ago, to hear the account of the travels of two successful African explorers of this character who had just returned home—Dr. Lenz, a Geologist, and Dr. Pogge. The latter had made a most remarkable journey, and one which placed him high in the list of African travellers. He had succeeded in penetrating from St. Paul de Loanda to the capital of the renowned African potentate, Muata Yanvo, a remote district which had hitherto never been reached by any explorer, and even by very few coloured Angola traders. The capital, Musumbé, lies to the north of Kabebe, the seat of government of that monarch, and many days' journey to the west and north of Cameron's line of march. Dr. Pogge travelled for pleasure as a hunter of the larger African game, and not as a scientific explorer; but some of the information he obtained was of high interest, particularly as to the healthiness and beauty of the interior plateau.

Geographers and Missionaries alike, Sir Rutherford went on to say, had thus far done their respective parts with untiring energy, and were ready to still further complete the work undertaken, by searching out and connecting the few missing links to the main lines. It was for trade, aided if need be by the State, jointly interested as both are in the realisation of such prospects as the latest discoveries opened, to take up the work. To our merchants and Government we must now look for the enterprise and means to accomplish the three great ends of so much previous effort—the development of a trade of vast national importance, the civilisation of Africa, and the suppression of the slave trade, for which last object, since the abolition of slavery in the British dominions, a sum of more than 70,000,000*l.* had been expended by this country. The brilliant

triumph of Stanley, it might fairly be hoped, would renew the lively interest once felt in the object of all Livingstone's labours. It was the deliberate opinion of both Cameron and Stanley that the opening up of Central Africa presented no insurmountable difficulties. The three high roads for waggons from the east coast, one to Victoria Nyanza, another to Nyassa, and a third to Tanganyika, would do all that was necessary to open up Central Africa, and substitute a legitimate commerce for the slave trade. The bullock-waggon and the steamboat would do the rest, until the time came for the rail and telegraph to complete the work. It might seem visionary to talk of such things for Central Africa, but the obstacles of these were not greater than had been overcome in other countries.

In conclusion, Sir Rutherford expressed a hope in which he felt confident all present would heartily join, that Great Britain, so long in the foremost rank, would not be the last on the muster-roll of those countries which are destined to bring the African race, and the inexhaustible wealth of their fertile soil, their mineral products, and free labour, within the circle of modern civilisation, and under the safeguard of public law and humanising influences.

Mr. CLEMENTS MARKHAM then read a paper by M. PHILIPPE BROYON-MIRAMBO, being a

DESCRIPTION OF UNIAMUESI, THE TERRITORY OF KING MIRAMBO, AND THE BEST ROUTE THITHER FROM THE EAST COAST.

The paper was prefaced with a brief biographical sketch of its author, who is a native of Switzerland, and about thirty-two years of age. At the age of eighteen he made his first voyage to Zanzibar as a seaman, and after a second voyage, having determined to remain at Zanzibar, served for some years in the offices of a trading house. During his voyages he learnt enough of navigation to enable him to take command of a small vessel which was engaged in the coasting trade about Zanzibar. Wishing for further travel and adventure, he gave up this employment, and went over to Saadini, on the mainland, where he joined a caravan journeying to the interior, and with it reached Urambo, in Uniamuesi. There he formed close friendship with Mirambo, the king of the country, and after going through the ceremony of blood brothership with him, married his eldest daughter.

Uniamuesi lies between 32° and 34° E. long., and from 2° 30′ to 6° S. lat. The great family of the Uniamuesi is divided into six large tribes, which, although very distinct from one another in general appearance, are very similar in respect of language and customs. The Wagazaganza, the most intelligent of these tribes, inhabit the central part of the east portion of the country, and trade chiefly in ivory. The other tribes are the Wassambua, inhabiting the western districts; the Watakama, the south-west; the Wakanongo, the south; the Wazinja, the north-west; and the Wasekuma, the north.

Previous to the reign of Mirambo the country was in a very disturbed state, owing to the raids of the Watussi, a people from the north, who scattered themselves all over the country, and, owing to the dissensions existing between the various chiefs of Uniamuesi, were able to tyrannise over all the tribes. But this state of things soon changed when Mirambo united all Central Uniamuesi under his rule, and the Watussi, instead of being masters, were soon reduced to the condition of servants. The different chiefs were allowed to remain rulers in all that concerns the interior government of the country; but in time of war are obliged to march at the head of their troops, under the orders of the supreme chief, any infraction of which was punishable with death.

The Uniamuesi believe in a God, but are very superstitious, and worship their ancestors. The most superstitious are the Wasekuma, who are always loaded with talismans and amulets; and from this tribe generally come the diviners and medicine men.

The Uniamuesi are polygamists, and are allowed to have as many wives as their means will permit. When a young man possesses a few iron hoe-blades, some beads, or one or two "doti" of cotton-stuff, he is in a position to marry. He begins then, with the aid of some of his friends, to build a hut; that finished, he offers his goods, through the mediation of a friend, to the parents of the girl he desires to have for his wife. After some debate, the bargain is concluded, and the *fiancée* at once enters into the business by preparing the pombé, or millet beer—the favourite beverage of all the people east of the great lake—against the wedding-day. On the day of the marriage, the father of the bride gives, according to his social position, it may be an ox, a sheep, or some fowls for the feast, to which all the village is cordially invited; and the tam-tam is in great force. After this ceremony, the husband has almost the right of ownership of his wife. If she deserts him, or if her conduct makes it desirable, she may be sent back to her parents, who are held responsible either to return the goods that were given for her, or to provide another wife.

The long period during which Uniamuesi had been subject to the yoke of the Arabs of Unianyembé had left its traces. One custom, instituted in former times by the Arabs for their profit, still remained, in spite of the check which Mirambo has placed upon their despotism. Thus, when a woman is maltreated by her husband, if she breaks any dish or weapon belonging to the chief of the village, she becomes by this act his slave, and is not given back to her husband unless she herself consents to this, and unless he pays a ransom for her to the chief. The Arabs, when they were in power, established this custom, and extended it to such a degree that any native, of whatever rank or sex, who broke or carelessly injured any article belonging to an Arab, was declared a slave, with all his family. All were fettered and sent off, either to Unianyembé, to be employed in the fields there, or westward to Tanganyika, to be exchanged for ivory among the cannibals, who fattened them up for eating.

As the villages are not generally inhabited by others than the descendants of the founder, sometimes the whole population of one of these was to be seen in chains, and the Arab who a day or two before only possessed some bundles of cotton goods, advanced to him it may be by a Banyan of Zanzibar, was a rich man by a single stroke, and could set up house at Unianyembé, in the sumptuous style of life so well described by Speke, Stanley, and Cameron.

As a rule, the Uniamuesi do not bury their dead, this rite being reserved for kings and chiefs. On the death of a chief the body is laced up with cords in a squatting posture, the head between the knees, and the hands closed over the eyes. The body is then lowered into a circular pit about 2 yards deep, and reposes on a circular seat or board.

The productions of the country are iron, found in great abundance in the south and west; and on the frontiers of Uvinza are salt-beds, the salt of which is of a very fine grain. Rice is much cultivated, as are also mtama, smaller millet, sweet potatoes, yams, ground-nuts, and bananas. At seed and harvest time the Uniamuesi generally remain at home. They are good agriculturists, and consequently provisions are abundant. There is very little cultivation, but extensive pasture lands; and butter, milk, and wild honey may be obtained very cheaply.

Being invited to address the meeting, Mr. E. HUTCHINSON, of the Church Missionary Society, said he fully agreed with the President's remarks respecting the future of Africa. He wished to call attention to the fact, that in Africa two missionary societies were labouring side by side. No doubt Sir Rutherford's experience in China had taught him what difficulties arose from

the introduction of various forms of Christianity into heathen countries; but the Church Missionary Society and the London Missionary Society afforded an illustration of how those who really had the welfare of a country at heart might work harmoniously together. Sir Rutherford was perfectly right in saying that, in dealing with the future of Africa, enterprise should proceed from the east coast. Those who were really interested in the matter had resolved to begin from the east coast. It was felt that if anything great was to be accomplished, there must be some radical change in the system of porterage. He considered that all interested in East Africa were greatly indebted to the researches, energy, and information furnished by Dr. Kirk, for it was he who had pointed out that the great obstacle to penetrating Africa—the tsetse fly—ceased to exist to the north of the river system, of which the Wami was the centre, and a higher level of country took the place of marsh and morass. The Church Missionary Society and the London Missionary Society were doing all in their power towards the establishment of civilisation and commerce. They had already received great assistance from Mirambo, who was going to establish on his own account a service of bullock waggons over the road which the Church Missionary Society had made. From information received from Colonel Gordon it appeared that King Mtesa was anxious for Christian teachers, and they had reason to hope that such facilities would be afforded by the Egyptian Government as to enable them to send missionaries and supplies up the Nile. With regard to the Belgian Expedition, he hoped they would make no attempt to establish themselves at Unianyembé, which was a fatal place for Europeans. The Church Missionary party were laid up there for a month by a most disastrous attack of fever. The Belgians would find Meninga a much more suitable spot, as it was a healthy place, with abundance of water. For the Niger Mission a steamer had been specially built for missionary and pioneer work, under Bishop Crowther, and the Church Missionary Society would do all in their power to work harmoniously with the Royal Geographical Society, should that society wish to make any exploration on that river.

The PRESIDENT, in conclusion, trusted that what had been said would increase the interest in the opening up of Africa. It was now merely a question of money whether it should be done speedily or at all; and it was with great delight that he had heard that the Church Missionary Society was about to provide the necessary facilities for the Christianising of the whole 5,000,000 subjects of King Mtesa.

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IMPERIAL RUSSIAN GEOGRAPHICAL SOCIETY.

Monthly Meeting of 5th (17th) October, 1877.

M. DE SEMENOF, Vice-President, in the chair. M. SREZNEFSKY, the Secretary, furnished an account of Colonel Prejevalsky's Expedition to Central Asia and the Lob-Nor country. The Colonel returned to Kuldja at the beginning of July last, and until the close of August had been engaged in arranging his collections. The scientific results comprise a route survey from Kuldja for a distance of 1200 versts into the heart of Asia, the determination of the latitude and longitude of seven points, a number of barometric determinations of height, meteorological observations taken four times a day, a botanical collection comprising 300 different species of plants, 94 skins of mammalia, 180 species of birds, 50 of fishes, 150 reptiles, and more than 2000 insects. There are also four wild camels, which constitute an attractive feature of the collection. The collections have been carefully packed, and are expected at the Museum of the Academy of Sciences in the course of the winter.

After resting for a brief time at Kuldja, Colonel Prejevalsky set out towards the end of August for Tibet. Having ascertained that it is impossible to reach Tibet by way of Lob-Nor and the arid desert beyond the Altyn-Tag Mountains, the Colonel decided to follow another route, by way of Guchen and Hami, and thence to make for Tsaidam and the sources of the Yang-tse or Murui-ussu. He thus reckons upon arriving at Lhasa about May or June, 1878, exploring Tibet, and returning to Russia in the autumn of 1879.

The Secretary communicated intelligence respecting M. Potanin's Expedition, letters from him having been received about the middle of September. The Expedition left Kobdo towards the close of March, in two parties: one, with the heavy baggage, making direct for Lan-chow; and the other, consisting of Messrs. Potanin and Rafailof, making for Hami by way of the Ulan Daban Pass, over the Ektag Altai Range and Barkul (the route between those two points being apparently a new one, lying between those marked on Mr. Ravenstein's map of Western Mongolia. See *Geographical Magazine* for July 1875). Hami was reached on the 16th (28th) May, and here, thanks to the good offices of M. Shishmaref, Russian consul at Urga, they were well received and housed by the Chinese authorities. On leaving Hami they journeyed northward, and crossed the Tian-Shan by the same pass as Colonel Sosnofsky had travelled by, and, turning to the east, skirted the northern side of the eastern prolongation of the Tian-Shan, a range covered with perpetual snow. On reaching the village of Nom-Tologoi the party turned northward, and, having traversed for the second time the desert of Gobi, reached the southern limit of the Adjia-Vogdo, a spur of the Altai Range. The latter was crossed by the Kernuru-Davan Pass, situated between the Saksa and Tsitsirin-Gol Valleys, and after crossing a parallel chain called Taimir-Ola, they arrived at Uliassutai on the 13th (25th) July.

A very plentiful botanical collection was made from the flora of the Tian-Shan and Altai, but that of the plains was excessively poor. The party contemplated an excursion to the sources of the Yenisei, and by the end of July they proposed starting for Lake Kossogol, and from thence making their way to Lake Ubsa, and by the way of the Chui River to Biisk.

Several members of the Society had made scientific researches during the summer. M. Raiefsky has been making inquiries on the production of and trade in wheat in northern Russia; Baron Osten Sacken is pursuing ethnological studies in Austria; M. Sidorof has traversed the Siberian Polar Sea and Sea of Kara from the mouth of the Yenisei to the coast of Norway; and M. Mainof has amassed much important ethnographical and geographical information from the country of the Finns of the Volga. The expedition, which will examine the water-parting between the Ob and the Yenisei, has been occupied in a preliminary investigation of all existing information on the subject, and will not begin its field work till next spring.

The Secretary read an extract from a paper he had compiled on Colonel Prejevalsky's discoveries, and the VICE-PRESIDENT dwelt on the scientific value of these researches, and of those of Sosnofsky, Kourapatkin, and others. Reference was also made by M. DE SEMENOF to Colonel de Thillo's work on the levels of the Aralo-Caspian region. M. MAINOF read a paper on his travels above referred to.

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BERLIN GEOGRAPHICAL SOCIETY.

May 5th, 1877.—Herr BASTIAN presiding. Herr von RICHTHOFEN read a paper on the ancient route across Asia of the silk merchants, from Ptolemy and Chinese sources, which we propose to lay before our readers in our next number. A discussion then ensued between the author and Herr KIEPERT, in which the latter expressed some divergence from the opinions put forward by the former.

June 22nd, 1877.—Herr BASTIAN presiding. Herr KIEPERT presented his new map of Armenia, which embraces all available information, and shows many additions to our previous knowledge of that region. Herr REISS read a paper on his travels in the northern part of South America, undertaken with Dr. Stubel, of Dresden. Both these travellers were geologists, and the object of their expedition was to discover volcanic mountains. They ascended the Magdalena River, in the Colombian States, and after remaining six months in the tract between Pasto and the boundary of Equador, crossed the frontier to Quito, which was the centre of their researches for five years. In 1875, they journeyed to the source of the Marañon, and eventually travelled down the river, and after visiting Pernambuco, Bahia, Rio, and other noted places, Herr Reiss returned to Europe in April 1876, while Dr. Stubel remained to undertake further journeys in Bolivia, Peru, and Chile. He was expected in Germany this autumn.

Herr POLAKOFSKY read a paper on the eastern part of the Republic of Costa-Rica, in the course of which he referred to the importance which this region had derived from schemes for constructing a ship canal across central America, and to our scanty geographical knowledge thereof. This is in a great measure due to the paucity of population, which amounts to 180,000 souls only, for a country as large as Bavaria, and which renders travelling costly and difficult. With the exception of the coast lines, the inhabited tract in the centre, and the route across from the Atlantic to the Pacific, the delineation of the country rests on the statements of hunters, gold-seekers, and caoutchouc-collectors. The newest map of Costa-Rica is Friederichsen's, published in Hamburg, in 1876, but this the author described as practically only an enlarged edition of that of Von Frantzius and Petermann, in 1869, and he furthermore cited several minor inaccuracies in the map, including one in the delineation of the northern frontier of the Republic. (Herr Friederichsen has since entered into a defence of his map. (See our November number, p. 306.).

July 7th, 1877.—Herr BASTIAN presiding. Herr NACHTIGAL read a paper on the present position of the International Association for the Exploration of Central Africa, giving a complete summary of the proceedings of the body, from its constitution up to the departure of the Belgian Expedition, in October last.

Herr ASCHERSON read some notes on the botanical results of Dr. Pogge's last journey into Central Africa, and Professor Jessen exhibited two maps designed by him, the first showing the extent of growth of wheat and the statistics of its yield and export, and the other the different regions or zones of fruit trees throughout the globe.

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FRENCH GEOGRAPHICAL SOCIETY.

October 17th, 1877.—M. LEVASSEUR presiding. After mentioning the prizes awarded by the Society to pupils in *lycées* in the recent competition, the PRESIDENT announced the purchase of a plot of ground for the erection thereon of a building suitable for the requirements of the Society. M. Marche, from the Ogowai, and M. Wiener, from Bolivia, were both welcomed on their return. The French consul at Zanzibar wrote to the effect that Captain Wharton, R.N., had surveyed, in a careful and detailed manner, the coast of Zanzibar from Monfia to Kilwa, and added some particulars respecting the stations founded on the island of Pemba, to serve as central places of resort for the negroes. Captain Wharton stated that proposals were afoot for laying a telegraphic cable from Aden, by way of Mozambique and Zanzibar, to the Cape of Good Hope, and for another from Mozambique to the Mauritius, by way of the Comoro Islands and the north of Madagascar.

The SECRETARY then read an account of M. Marche's travels along the Ogowai River. M. Marche was deputed by the Minister of Public Instruction to accompany M. de Brazza as Naturalist. He arrived at the Gaboon in October 1875, and having provisioned his party at Sam-Quita, he finally reached Lope in February 1876. He then explored the River Ofue, which appeared to come from the south-west, and, ascending the Ogowai, reached Ivindo, the furthest point attained by Compiègne and himself in 1874. After meeting M. de Brazza on the 18th August, the two ascended the river in company for a brief space, and then M. Marche pushed on by himself, and having passed the furthest point reached by Dr. Lenz, he finally halted on the 28th September, at a place called Byango. A little distance beyond that point there runs a river called Bombi, which (as it would appear from the native account) unites the Congo or Zaire with the Upper Ogowai, and forms a medium of intercommunication for trade. This fact (M. Marche added) is borne out by old Portuguese maps.

The SECRETARY then read an account of M. de Ujfalvy's travels in Ferghanah, and M. Duveyrier followed with an account of Mr. Stanley's exploration of the Lualaba or Congo. M. WYSE presented a large-scale map of the Isthmus of Darien, and the Baron DE CHAMPLOUIS one of Belgium and the north and north-east of France, shown continuously, so as to illustrate the route of the Nord railways.

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PARIS SOCIETY OF COMMERCIAL GEOGRAPHY.

October 26th, 1877 —M. MEURAND presiding. M. CH. HERTZ read a brief summary of the doings of the society up to date, including the part it played at the Association for the Advancement of Science at Havre, where it was represented by M. Coquelin and M. Capitaine. M. MOUNIE read a paper on the basin of the Rio Colorado, and its suitableness for colonisation. M. BRAV DE SAINT-POL LIAS gave an account of the proceedings of his colonising party in Sumatra.

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